metric measures

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CONTENTS

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metric measures

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Working Standard Balances : Part 2—General Specifications

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PART 1 dealt with guiding factors in the design of working standard balances used by the Inspector of Weights and Measures for the verification of commercial weights. The various factors were analysed and discussed. In this Part it is intended to outline the considerations that led to the establishment of a general specification for working standard balances. The present Weights and Measures (Enforcement) Rules of the States prescribe mainly the capacities, sensitivity and beam length. Many important details of design are left to manufacturers.

Inspector's Duties and Needs

The requirements of the balances to be used by the Inspector would naturally have to be such as would render the instruments useful to him in the normal range of his activities. It is, therefore, necessary to consider briefly the nature of his duties and the requirements of the instruments he would have to use.

The Inspector of Weights and Measures has to carry out his duties in either urban areas or rural areas. He normally has to verify weights, measures and weighing and measuring instruments in 2,500—3,000 shops or commercial establishments. The verification of ordinary weights has to be done once in two years but that of bullion weights every year. Besides, he has to undertake frequent inspections of weights during the interval between two successive verifications to ensure that only weights which are correct within the allowed errors are being used in commercial transactions.

In rural areas, the traders are spread over a large area and the Inspector has to undertake frequent tours to verify weights, measures etc. during the specified period and to inspect them in the interval. This means that he has to be on tour for many days at a stretch. He has also to carry his equipment around including standard weights and balances. When he is on tour he would require balances which could be transported easily in trains, buses, bullock-carts, and in some mountainous areas, even by mule pack. His balances, should, therefore, be such that they would not be affected by the hazards and bumpings of transport. If the Inspector has to do his work quickly and efficiently, the balances should be capable of being easily assembled in his camp and ready for use within a short time.

If the Inspector has to cover urban areas, the shops are situated in comparatively very small areas and the traders can easily and conveniently bring their weights to the

Inspector's office for verification. In fact, in many cities the traders prefer to bring the weights to the Inspector's office so as not to disturb their routine of trade. So he generally has a permanent establishment in the locality assigned to him and he sets up a small verification laboratory. In this case, the balances do not have to be transported and are kept in the laboratory and operated by the Inspector. It is, therefore, possible to have the balances fixed in the laboratory, in a glass or wooden case, if so desired.

The Inspector thus requires two types of balances, one type for outdoor use in rural areas *i.e.* portable and another for indoor use in urban areas *i.e.* stationary.

Influence of Bullion Weights

On his balances the Inspector would verify and weigh cast iron, ordinary brass, bullion and carat weights. The first three types of weights are commonly used in cities as well as in rural areas. Carat weights are mostly used in very large cities as their use is restricted to the weighing of real pearls, diamonds and the like.

In drawing up specifications, it has to be borne in mind that the Inspector's balances would be used for weighing bullion weights in villages also. Bullion weights are used not only for weighment of gold but also of silver and silverware. Silver is often weighed out in large quntities—much larger than gold. A brick of silver may weigh upto 30 kg while the maximum weight of a gold bar is 1 kg. A number of bricks of silver are sometimes weighed at a time. Besides the bullion trade, doctors, chemists, vaidyas, perfumers, jari workers and others also use bullion weights. These weights, which have a wide range from 20 kg to 1 mg, find their use in different trades and have to be adjusted with great care and accuracy.

The enforcement laws of the States provide that unlike ordinary weights of cast iron and brass, bullion weights should be checked every year in order to maintain accuracy in dealings of commodities which are normally expensive. The Inspector's balances should, therefore, be of such precision and sensitivity that they can be used for the weighment and verification of bullion weights.

No Discrimination

The point has often been raised whether in view of the accuracy expected in bullion weights and to reduce the cost of the Inspector's equipment and to make it simpler, the users of such weights in rural areas should be required to go to the Inspector's permanent laboratory at his headquarters to have their weights verified.

This argument has its roots in the practice in many Western countries where the users of high precision or bullion weights are expected to take them to the Inspector's headquarters for verification every year. This saves the touring Inspector the responsibility of carrying sensitive balances and he can use rougher instruments. It is argued that if the Indian Inspector in the rural area also has to verify only ordinary weights of cast iron or brass, he could use ordinary beam scales of Class C like the ones prescribed for weighing rice, wheat etc. or simple steelyards as is done in some of the Western countries. If the Inspector's equipment is thus simplified, the expenditure on equipment would also be lowered.

This argument appears reasonable at first sight. A scrutiny of the pattern of the bullion trade in the West, however, reveals the fallacy. In the West, bullion traders in rural areas are almost non-existent. Most of these traders are concentrated in the large cities and even village folk go to the

nearest city to buy gold and silverware or ornaments.

In India, the villager is very conscious about the purchase of gold and silver, either in the chip form or as ornaments. In fact, he prefers to buy gold or silver with his savings rather than invest them in any securities or other bonds. It is not uncommon to see village belles going about with anklets of silver, each weighing as much as 500 grams. The villager normally has his ornaments, particularly of silver, made by the village goldsmiths in his presence.

The Indian villager is also a shrewd person. If he finds that the Inspector who comes to his village, verifies only cast iron and brass weights but not bullion weights because his equipment has to be cheap, he would rapidly lose faith in the verification process. He would not understand why the Government cannot give better equipment to the Inspector and let him verify all types of weights during his tour. Moreover, he believes more in what he can see, than in what he cannot. So, even if his goldsmith did go to the city and have his weights verified, he would still suspect the authenticity of the goldsmith.

What about the goldsmiths and other users of bullion weights ? They would be seeing the weights of other traders verified but they would themselves be expected to carry their weights even 50 kilometres to the Inspector's Office and back. There would be delays and they may not be able to get their work done in one day. They would then feel harassed. They would also grumble about the Government's discrimination in verifying the weights of other traders on the spot in the villages but not theirs.

In a newly independent, developing country like India such a grouse about a new and far-reaching reform is not desirable. The benefits of the facilities that the Government provides should be taken directly to the people rather than expecting the people to undertake long journeys and tedious waiting to derive benefits from them.

From whatever angle one looks at the problem, the conclusion is inescapable that in the present economic and trade conditions in India and the pattern of our bullion trade, the Inspector should verify bullion weights also when he goes on tours to villages and rural areas.

The first requirement, therefore, of the Inspector's balance can now be established. The Inspector need not carry two types of equipment—one for verifying cast iron weights and another for bullion weights. There need be only two types of balances more or less of the same specification : one for use in urban areas where the balances are fixed in the laboratory and another set which can be transported easily, assembled quickly and operated accurately.

Capacities

Having examined the fundamental factors which have a vital bearing on the type of equipment the Inspector requires, it is now necessary to lay down capacities of the balances. The capacities would have to be related with the denomination of weights. The heaviest commercial weight is 50 kg while the smallest is 1 mg. A single balance of 50 kg capacity cannot meet the requirements. It is also desirable that the balance should be used for the weighing of the least number of weights commensurate with its ability to weigh, so as not to overload it and damage it. On consideration of these factors and on the basis of scientific facts, the four capacities shown in Table 1 were laid down.

TABLE 1

CAPACITIES OF BALANCES

Capacity (1)	Number of Weights to be Verified (2)	
50 kg	50 kg, 20 kg, 10 kg	Three pieces
5 kg	5 kg, 2 kg, 1 kg, 500 g	Four pieces
200 g	200 g, 100 g, 50 g, 20 g, 10 g, 5 g	Six pieces (& carat weights up to 20 carats)
2 g	Remaining weights from 2 g to 1 mg	(eleven pieces + carat weights)

It will be noticed that balances used for heavy weights handle a comparatively smaller number of weights, while the balance with the lowest capacity handles the largest number of weights. This is in keeping with scientific practice.

Sensitivity

Having specified four capacities, it is necessary to consider the sensitivities for the balances. For the purpose of these balances, sensitivity is taken to mean 'the ratio between the change in mass in one pan of the balance and the corresponding deflection of the beam or the attached pointer produced by this change'. Sensitivity is expressed in milligrams per division.

Before considering how sensitivity could be prescribed, it is necessary to examine the permissible errors allowed for various types of weights, because every balance is to be used to ascertain whether the weights compared on it are within the prescribed tolerances or not. The States' Weights and Measures (Enforcement) Rules lay down certain permissible errors for the verification and inspection of commercial weights. Table 2, extracted from a comprehensive table prepared by the National Physical Laboratory of India, indicates clearly the permissible errors for the various types of weights.

TABLE 2

PERMISSIBLE ERRORS FOR THE VERIFICATION AND INSPECTION OF VARIOUS TYPES OF WEIGHTS

Denomination of Weights (1)	Maximum Permissible Errors							
	Coarse Grade C. Iron Weights		Medium Grade Brass Weights		Bullion Brass Weights		Commercial Carat Weights	
	Excess mg (2)	Def. mg (3)	Excess mg (4)	Def. mg (5)	Excess mg (6)	Def. mg (7)	Excess mg (8)	Def. mg (9)
50 kg	20 000	10 000	—	—	—	—	—	—
20 kg	10 000	5 000	—	—	500	250	—	—
10 kg	5 000	2 500	—	—	250	125	—	—
5 kg	3 000	1 500	—	—	150	75	—	—
2 kg	1 600	800	—	—	80	40	—	—
1 kg	1 000	500	250	125	50	25	—	—
500 g	600	300	150	75	30	15	—	—
200 g	400	200	100	50	20	10	—	—
100 g	320	160	80	40	16	8	8·0	4·0
50 (40) g	—	—	60	30	12	6	6·0	3·0
20 g	—	—	50	25	10	5	5·0	2·5
10 g	—	—	40	20	8	4	4·0	2·0

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
5 (4) g	—	—	30	15	6	3	3·0	1·5
2 g	—	—	20	10	4	2	2·0	1·0
1 g	—	—	10	5	2	1	1·0	0·5
500 (400) mg	—	—	8·0	4·0	1·6	0·8	0·8	0·4
200 mg	—	—	6·0	3·0	1·2	0·6	0·6	0·3
100 mg	—	—	4·0	2·0	0·8	0·4	0·4	0·2
50 (40) mg	—	—	2·0	1·0	0·4	0·2	0·2	0·1
20 mg	—	—	2·0	1·0	0 4	0·2	0·2	0·1
10 mg	—	—	1·0	0·5	0·2	0·1	0·1	0·05
5 (4) mg	—	—	0·4	0·2	0·2	0·1	0 1	0·05
2 mg	—	—	0·2	0·1	0·2	0·1	0·1	0·05
1 mg	—	—	0·1	0 05	0·1	0·05	0·1	0·05

The balance should be so sensitive as would enable it to weigh out the deficiency tolerance of the smallest weight to be weighed on it. Thus, for example, on the 50 kg balance, the smallest weight weighed would be 10 kg. The most stringent accuracy for a 10 kg weight is for bullion weights and the permissible error in deficiency is 125 mg. So the roughest sensitivity for this balance should be at least 125 mg, if a deflection of just one division is to be obtained. In order to make it possible to have a larger deflection so that it could be read easily the sensitivity was ultimately made finer and brought to 100 mg. Similar considerations were applied to the other three balances.

Table 3 indicates the sensitivity in milligrams per division prescribed for each type of balance.

TABLE 3

SENSITIVITIES OF BALANCES

Capacity	Deficiency Tolerance on		Sensitivity in mg per division
	Highest Weight	Lowest Weight	
	(*See Table* 2)		
50 kg	10,000 mg	125 mg	100
5 kg	75 mg	15 mg	10
200 g	10 mg	1·5 mg	1·0
2 g	1·0 mg	0·05 mg	0·02

It will be seen that the sensitivity to be prescribed for balances is the maximum that can be laid down for the particular balance. It is not desirable to refine the sensitivities of the balances further, because an Inspector has to weigh on an average 150 to 200 weights every day. If the balance is over-sensitive he may not be able to do his work quickly and efficiently.

Beam Length

The third important factor is the beam length. The beam is the most important part of the balance. The beam should neither be too long nor too short. It should be such that, in an outdoor balance, it could be accommodated easily in a box. It should also be capable of being suspended from a tripod when assembled. This box again should be of such dimensions that it can be safely carried in the type of transport available to the Inspector. Taking all these factors into consideration, the following beam lengths were prescribed.

TABLE 4

BEAM LENGTHS

Capacity	Beam Length
50 kg	750 mm
5 kg	250—300 mm
200 g	150—200 mm
2 g	120—150 mm

Other provisions in the Weights and Measures (Enforcement) Rules require that the balances should be of the outdoor or indoor type, the reason for which has already been

stated, and should be constructed of non-magnetic materials and be robust in construction. They should also be capable of being easily assembled. It is also provided that outdoor balances should be fitted in suitable carrying cases and smaller ones should have glass cases. Portable balances of 5 kg and below should be fitted into one carrying case for ease of transport. The details of manufacture, like materials, beam shape, knife-edges, bearings, pan dimensions, suspension arrangements and so on are left to manufacturers.

It is intended to discuss the design aspects of working standard balances in the next article.

Conversion of Workshop Machine Tools & Measuring Devices

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IT will be recalled that at a Conference of representatives of various universities and engineering and technical institutions held on 23 October 1960, a programme of change-over to the metric system in higher technical education was worked out (See *Metric Measures*, Jan. 61, pp. 19—21).

The phased programme envisaged the adoption of the metric system in teaching in the first and second year classes from the academic session 1962-63. The third and fourth year classes would follow in 1963-64, the programme being completed in 1964-65.

The change-over in the workshops of technical institutions is an important aspect of the change-over. In order to assess the cost of a change-over in workshops, studies were carried out by some organisations. In this article are presented the results of a study of the changes required and the cost involved with specific reference to the equipment available in the engineering workshop of the Delhi Polytechnic. The workshop is capable of training 135 students.

The scheme of conversion is discussed in three parts :

Part—I : Lathes.
Part—II : Drilling, Shaping and Milling Machines.
Part—III: Measuring Appliances and Tools.

PART—I : LATHES

There are 14 lathes in the Delhi Polytechnic Workshops with belt drive, the drive being taken from a motor fixed in the lower part of the leg of the lathe. There is a three-stepped cone pulley for effecting the change of speed. These lathes are provided with a train of gears to suit various thread-cutting speed ranges.

Of the various jobs for which a lathe can be used, turning to specified diameters is

the most important. The performance of this operation does not require any conversion on the lathe itself, but the tool travel at right angles to the axis of the job is controlled by a dial which is at present graduated in the British system. This dial is to be replaced by one graduated in the metric system. The movement of this travel is guided by manual operation and hence the extent to which the tool will travel per revolution of the rotating dial can be worked out in metric system and a new dial graduated in the metric system provided as follows :

At present one complete revolution = $\frac{1}{8}$" travel (125 divisions)

So each division = $\frac{1}{8} \times 1/125 = 1/1000$".

Altered Dial

Divide the dial into 127 parts. Each division will represent 0.025 mm tool travel and so 4 divisions will represent a tool travel of 0.1 mm.

Similarly for the compound slide whose dial is at present divided into 125 divisions, each division representing 1/1000", the altered dial is divided into 127 divisions, each division representing 0.025 mm.

The other important operation on the lathe, namely, thread-cutting, involves the following changes in the gear-train of the lathes for conversion to metric system. The gear-train on this particular type of lathe has 12 gears. By a combination of several of these at a time, threads ranging from 4 to 40 per inch can be obtained. The object in conversion is to obtain corresponding pitches in the metric system. This can be done by providing further additions to the gear-train to enable the altered gear-train to yield an ultimate thread-cutting speed which will cut threads standardized in the metric system. On this particular set of lathes this has been achieved by providing an additional set of 12 gears per lathe, the number of teeth on these being 18, 20, 24, 26, 28, 36, 100, 127/100 and 72/18.

For example : to obtain a metric pitch of 1.0 mm (per thread) the gear-train on this lathe would be 40, 127, 100 and 100.

$$\text{Gear train ratio} : \frac{\text{Driver}}{\text{Driven}} = \frac{8}{25.4} = \frac{40}{127} \times \frac{100}{100}$$

Similar provision has been made to cut 33 metric pitches ranging from 0.2 mm to 6 mm.

Cost Data (Manufacture of Gears)

(a) *Turning & Milling*

	Rs.
(1) Number of additional gears required per lathe : .. .. .. (4 cast and 8 cut from steel rounds)	12
(2) Cost of pattern-making :	
4 gear blank patterns @ 3 Rupees each	12·00
Cost of pattern for one bracket ..	21·00
TOTAL COST ..	=33·00
So cost of pattern making for 15 lathes	33·00
Distributed per lathe .. .	2·20
(3) Casting charges for 4 gears weighing 15 kg @0·65 Re/kg	9·75
(4) Casting one C.I. bracket 4 kg @0·65 Re/kg	2·60
(5) Cost of material for 8 steel gears @60 nP/kg for 6 kg	3·60
(6) Turning and milling (labour charges) for (3) and (4) above (labour at Rs. 6/day for 3½ days)	21·00
(7) Turning and milling (labour charges) for (5) above (labour 3 days @ Rs. 6/day)	18·00
(8) 3 Sleeves with bolts nuts 2 days @ Rs. 6/day	12·00
(9) Labour charges of one helper 8 days @ Rs. 3 per day	24·00
	93·15
Overhead charges @ 17½% ..	18·63
	111·78
	say 112·00

	Rs.
(b) *Dials & Indexing*	
Cost of making and indexing 3 dials @ Rs. 10 per dial.	30·00
17½% overheads (say 1/5)	6·00
So dials and indexing charges	36·00
(c) *Machine—Hour charges*	
Hourly rate for lathe 0.75 Re/ hour	
Hourly rate for milling machine @ Rs. 1.25/hr. (hourly rate includes depreciation, electrical power, P.O.L. and tooling).	
Lathe hours =30	
Milling hours =20	
So machine-hour charges for lathe	22·50
& machine-hour charges for milling machine	25·00
Total machine-hour charges	=47·50
Totalling up the cost data :	
(*a*)—Turning & Milling ..	=112·00
(*b*)—Dials & Indexing ..	=36·00
(*c*)—Machine-Hour Charges	=47·50
Total Conversion Charges/ Lathe	=195·50
say	=196·00

A difficulty encountered in conversion needs mention here. In thread-cutting, the tool is required to trace back its path to deepen the groove. This is normally made possible by the provision of a thread-chasing dial which is geared off the lead screw. In the conversion of this lathe, a similar provision is not possible and hence a reversing switch is provided. The precaution to be taken is that the reversing switch has to be altered from the 'forward' to the 'backward' position just at the end of the forward travel. By suitably training the operator in this work, it is possible to avoid an over-run of the tool beyond the limit of the thread-cut portion.

Alternatively, the lead screw of the machine itself will have to be changed to the metric pitch; this change would need further alterations of the saddle and other parts. These drastic alterations would make the conversion complicated and costly. Hence we adopted the device of providing a reversing switch. So including the cost of the *reversing switch*, estimated at Rs. 50 per switch, the cost of conversion works out to Rs. 246 (196+50).

PART—II—DRILLING, SHAPING & MILLING MACHINES

Drilling Machine

Apart from lathes which are a 'must' for any machine shop laid out for training purposes, the workshop must have at least a few drilling machines, a couple of shaping machines and one milling machine.

The drilling machine is usually a bench drill capable of taking in drills up to diameter of $\frac{1}{2}''$-$\frac{3}{4}''$. The drill shanks are of common standards both in the metric and the existing systems, as also the corresponding sockets in the drilling machines. Therefore, even with the drills in the metric diameters, there is no major conversion involved in the bench drill.

In some drilling machines there is a vertical scale parallel to the axis of the drill, which will have to be replaced by a metric scale. The replacement is estimated to cost Rs. 10 per machine, whether done within the workshop or outside.

Shaping Machine

There is no major conversion involved in this machine except to change into metric units the scale indicating the extent of horizontal travel. This change will cost approximately Rs. 10 per machine.

Milling Machine

The conversion of the milling machine presents some peculiar problems. A large variety of cutters are used on this machine

and the cutters have standardised characteristics in the FPS system. The new cutters in the metric system are designed for metric bores to suit metric arbors, though as a transitional measure inch arbors are provided at present. The conversion of the milling machine, therefore, involves change of arbors and sleeves into sizes as standardised in the metric system. This is a long-range measure. For immediate use metric cutters with standard inch bores are available commercially. The manufacture of metric arbors to the degree of precision required is beyond the competence of a normal training institution and it is advisable to purchase metric arbors and sleeves in one standard size. One set of arbor and sleeves is likely to cost Rs. 1,500.

PART III—MEASURING APPLIANCES & TOOLS

One of the important aspects of metric conversion is the change-over of the measuring appliances and tools from the existing ones. Most of the existing measures have to be scrapped and to that extent the salvage value of the existing measures is negligible. The expenses for the new measures have to be a fresh investment. Taking into account the normal shop capacities for training, the following provision has to be made:

Nature of Shop	Training Capacity (Seats)
Fitting Shop	30
Carpentry ..	30
Machine shop	15
Smithy .	15
Welding .	15
Sheet Metal	15
Foundry ..	15
	135

Based on the above strength the following quantities of measures are recommended :

		@	=Rs.
Steel scales			
150 mm	60	1·75	105·00
300 mm	60	3·50	210·00
Brass scale : 300 mm ..	15	5	75·00
Wooden scale folding type : 500 mm	10	4	40·00
Contraction scale : 500 mm	18	45	810·00
Vernier callipers : 150 mm	5	100	500·00
Depth gauge (micrometer) : (0-150 mm)	2	125	250·00
Height gauge (0 to 300 mm)	2	250	500·00
Feeler gauge	5	6·50	32·50
Radius gauge (upto 25 mm)	5	25·50	127·50
Screw pitch gauge	5	18	90·00
Micrometers (outside) : 0 to 25	30	60	1800·00
25 to 50	15	85	1275·00
50 to 75	5	90	450·00
75 to 100	3	110	330·00
Micrometers (inside) : 60 mm to 200 mm	1		160·00
Sine Bar 125 mm	1		350·00
Slip gauges (workshop grade) (about 65 pieces)	one set		1500·00
Combination set (300 cm) ..	2	165	330·00
Vernier gear tooth calliper (2 to 20 mm)	1		375·00
Dial indicators	2	100	200·00
Vernier bevel protractor ..	1		200·00
			9,710·00

A lump sum provision should be made in respect of drills, reamers, taps, dies and milling cutters as these are in varied sizes and are also designed to meet different types of needs. It would, therefore, be impracticable to list out and evaluate these items. The proposed lump sum provision is Rs. 8,000. The total estimated expenditure under 'measuring appliances and tools' is Rs. 17,710.00.

Metric System for Payments in Mining Industry

GUY KNOCHE

French Economic and Technical Bulletin,
Paris

VARIOUS methods exist for determining a miner's pay, and in the most complicated cases, which are also the most frequently encountered, the use of the metric system would considerably simplify the calculations involved.

The miner can receive a fixed salary. This is the simplest case. This salary is calcuated on the basis of hours worked or by the day and a simple multiplication enables the pay to be determined immediately. For example, should the hourly rate be fixed at 1.4965 NF and should the working week consist of 42½ hours, the basic wage would come to 1.4965×42.5 or 63.60 125 NF, rounded off to 63.60 NF as the centime, or hundredth part of the new franc is the smallest monetary unit in current use.

Many other items, which we will return to later, have evidently to be added to this basic wage.

Payment for Piecework

Other cases, which are not quite so simple, are encountered when dealing with piecework. Here one has to evaluate the quantity of work carried out. In this case, one of the simplest methods is to count the number of tubs which have been filled by the miner throughout the day. Having fixed the rate per tub in advance, one may arrive quite easily at the basic wage by means of an elementary multiplication.

A more complicated, but widespread, case is payment on the basis of 'volume dug'. Let us take a numerical example.

Suppose, for example, that a miner is working in a seam 1.37 metres high and 1.63 metres wide.

If he advances 3.23 metres in his working day and his work be paid (basic salary) at the rate of 1.57 NF per cubic metre dug, then his basic pay for the day in question is quite easily arrived at, as follows :

(1) Volume dug :

$1.37 \times 1.63 \times 3.23 = 7.212913$ cubic metres. This volume is calculated exact to the nearest cubic centimetre, and, taking into consideration the monetary unit, this figure can be rounded off to 7.213 cubic metres.

(2) Remuneration :

$1.57 \times 7.213 = 11.32441$ NF, rounded off to 11.32 NF.

If, now, we consider the same calculation using a system such as that which is in use in Great Britain, our data becomes :

Height of cut :	5 ft. 4 in.
Width of cut :	4 ft. 6 in.
Day's advance :	10 ft. 7 in.

Pay rate : 1 shilling and nine pence per cubic yard.

Several complicated calculations will have to be carried out to work out the day's pay.

First, that of the volume dug :

$5'4'' \times 4'6'' \times 10'7'' = 64'' \times 54'' \times 127'' =$ 438,912 cubic inches=254 cubic feet=9 cubic yards 11 cubic feet.

Finally, that of the remuneration, which ultimately works out to 16 shillings and 5 5/9 pence.

And all this is just for the basic wage. There are many other items which are added to this. For example, an hourly indemnity, given in France in NF, a production bonus (paid yearly), a results bonus (paid weekly according to a fixed percentage per week each time), a shoring bonus (calculated on the basis of timbers placed), a 'lunch basket' bonus (an indemnity for meals taken inside the mine), bonuses, where applicable, for difficult working conditions, an indemnity for mineshaft drilling (worked out generally according to the number of metres drilled), a housing indemnity etc. At the same time, the theoretical gross salary which is arrived at by the addition of the various above items has to be reduced by various dues ; social security (worked out as a percentage of salary upto a certain ceiling), retirement pay (also a percentage), etc.

Drawing up the miner's wagesheet is thus quite a complicated operation. However, it presents no particular difficulty so long as the decimal metric system is used. This is by no means the case when at one and the same time a measuring and a monetary system neither of which is decimal has to be used.

Maharashtra Syllabus for Mathematics

(The use of the metric system of weights and measures is now becoming compulsory in many areas in the country and within a year or so all transactions would have to be carried out in terms of the metric system.

In view of these rapid changes, it is necessary that the education of the younger generation should be oriented towards the practical use of the metric system. With this aim in view, the mathematics syllabi for schools are being revised to bring in the use of the metric system, eliminate the old, and emphasise the teaching of decimals rather than that of fractions as was done earlier. The States have now started revisions of their syllabi.

The revised syllabi for mathematics for Standards I—VII adopted by the Government of Maharashtra is published here.—*Editor*)

Standard I

(1) Counting, (forward and reverse orders), understanding, reading and writing numbers upto 100 with the help of concrete objects. Understanding of units and tens in numbers of two digits.

(2) Recognition of Indian coins (New).

(3) Oral addition and subtraction of any two numbers from 1 to 9.

(4) Written addition and subtraction of two numbers of two digits provided there is no figure on hand.

(5) Easy problems in addition and subtraction involving one step.

(6) Multiplication tables upto 10×10.

Standard II

(1) Revision of the work done in Standard I—Both oral and written. Addition and subtraction of numbers (Horizontal as well as vertical).

(2) Recognition, understanding and writing of numbers upto 1,000 with particular attention to the place value of digits.

(3) Addition and subtraction of three digits with the concept of figure on hand.

(4) Multiplication of numbers of not more than two digits by a multiplier of one digit.

(5) Knowledge of table of time :

24 hours	..	1 day
7 days	..	1 week
30 days	..	1 month
12 months	..	1 year

(6) Introduction of division verbally through activity method.

(7) Problems in addition and subtraction involving one or both.

(8) Multiplication tables upto 15×10.

(9) Easy problems in multiplication involving multiplication of a number of two digits with a one digit number.

Standard III

(1) Revision of the work done in Standard II.

(2) Recognition, understanding and writing of numbers upto one lakh (1,00,000).

(3) Multiplication tables upto 25×10 and 30×10.

(4) Multiplication of numbers of two or three digits by a number of not more than two digits.

(5) Division of numbers of not more than four digits by a number of not more than two digits.

(6) Resolving numbers of not more than two digits into two factors. (This should be taught through the interrelation of multiplication and division).

(7) Simple problems in multiplication or division or both.

(8) The following tables of time, length, weight and capacity :—

(*a*) 60 seconds = 1 minute
60 minutes = 1 hour
(Telling time from the clock)

(*b*) 100 centimetres = 1 metre
1000 metres = 1 kilometre

(*c*) 1000 grams = 1 kilogram

(*d*) 1 litre = 1000 millilitres

These should be introduced by demonstration.

(*e*) Idea of a dozen.

(9) Compound addition and subtraction involving tables learnt.

Standard IV

(1) Revision of the work done in Standard III.

(2) Reading and writing of numbers upto and including crores.

(3) Consolidation of skill in the four processes.

(4) (*a*) Introduction of simple fractions like $\frac{1}{2}$, $\frac{1}{4}$, $\frac{3}{4}$ and 1/10.

(*b*) Preparing tables of halves and quarters.

(*c*) Introducing the idea of decimals with reference to writing money, addition or subtraction of money.

(5) Introduction of the L.C.M. of one-digit numbers.

(6) Introduction of the unitary method and solution of simple problems (not involving fractions) on:

(*a*) Profit and loss,

(*b*) Calculation of simple interest on sums involving multiples of 100 only;

(*c*) Rates, taxes and wages.

(7) Simple problems involving units of the metric system done in Standard III.

(8) Elementary postal information such as purchase of cards, envelopes, stamps etc. upto 100 nP.

(9) Recognising and drawing of geometrical figures—a rectangle, a square, a circle and a triangle using stencils.

Standard V

A—Arithmetic

(1) Revision of the work done in Standards I to IV.

(2) Prime numbers, factors, divisibility of numbers by 2, 3, 5, 9, 10 and 11, L.C.M. and G.C.M. of numbers of not more than three digits.

(3) Similar and dissimilar fractions and four operations in simple fractions and their simplification (not involving more than four fractions).

(4) Simple problems in proportion by fractional method direct and inverse.

(5) Further problems on profit and loss, problems on simple interest, involving calculation of interest, amount and principal.

(6) Complete tables of the metric system (of length, weight and capacity).

(7) Four fundamental operations of decimal fractions.

(8) Areas of rectangular figures: Problems on areas of rectangular figures involving estimate of costs.

B—Geometry

I—Demonstrational

(1) Concept of a point, concept of a straight line (no definitions).

(2) Concept of an angle—a right angle, a straight angle and angles about a point (4 right angles).
Idea of acute and obtuse angles.

(3) Two straight lines becoming parallel to each other.

II—Practical

(1) Drawing of a straight line of a given length.

(2) Drawing right angles with set squares.

Standard VI

A—Arithmetic

(1) Revision of the work done in Standard V.

(2) Averages—simple problems.

(3) Percentage (to be interrelated with decimal fractions).

(4) Simple interest involving calculations of rate and time.

(5) Preparing and verifying bills and receipts—simple examples on shopping.

(6) Postal information : money orders and parcels.

(7) Column-graphs—reading and preparing.

B—Geometry

Practical

(1) Revision of work done in Standard V.

(2) The use of a protractor to measure and draw angles.

(3) The circle and its parts and their relations—use of the pair of compasses.

(4) Construction of a triangle given three sides.

Demonstrational

(1) The properties of adjacent angles, vertically opposite angles, supplementary and complementary angles and angles on two parallel straight lines by a transversal; sum of the angles of a triangle.

(2) The sum of any two sides of a triangle is greater than the third side (definition of a straight line).

Standard VII

A—Arithmetic

(1) Revision of the work done in Standard VI.

(2) Simple examples on time, transport and speed, work and wages.

(3) Proportion and proportional parts—simple problems: partnership.

(4) Compound interest—period not exceeding three years, calculating compound interest half-yearly. Use of a table for finding compound interest for a period of more than 3 years.

(5) Bank accounts and their operations.

(6) Square and square-roots by factorisation.

(7) Areas of triangles and circles.

(8) Cubic measure—Volume of rectangular objects.

(9) Maintenance of household accounts—preparation of cash accounts of school activities.

B—Geometry

Demonstrational

(1) Properties of different types of triangles based on angles and sides.

(2) Congruency of triangles.

Practical

(1) Construction of triangles given two sides and the included angle; one side and two angles. Construction of a right-angled triangle, given hypotenuse and one side.

C—Algebra

(1) Use of symbols to represent numbers (Algebra as shorthand arithmetic).

(2) Solving simple problems and equations.

(3) Simple useful formulae and examples based on them.

Change to the Metric System in U. K. ?

(The following Statement on the possibilities of the change-over to the metric system has been published in the May 1962 issue of *BSI News*, pp. 11-14. The Statement indicates a 20-year programme of change-over to the metric system, if the Government directs the change-over.

About a year ago the British Standards Institution (B.S.I) set up a special committee to assess trends towards the use of the metric system in British industry and to recommend the steps which the B.S.I should take. The findings of this Committee, whose members were drawn from B.S.I.'s Executive Committee and Export Panel, have led to the following Statement by the B.S.I. It is being circulated widely to British trade and industry, with a view to examine the case for a change to the metric system industry by industry and a conclusion reached.

The Statement of the B.S.I. published above, was discussed at the 1962 Standards Engineers' Conference held in London on 15 and 16 May 1962. It was organised by the British Standards Institution in conjunction with the Institution of Production Engineers. This account of the discussion is taken from the June 1962 issue of *BSI News*, pp. 27-28.

It is hoped that the Statement would be of interest to readers of "*Metric Measures*".—*Editor*)

IT is evident that an increasing volume of opinion in this country regards a change to the metric system as essential and even inevitable, though it does not minimize the costs and the difficulties, which to the country as a whole and to some industries in particular would be formidable. These costs and difficulties would, however, increase rather than diminish as time goes on.

From the point of view of the United Kingdom's export trade as a whole, the use of the metric system and of metric standards will be increasingly demanded by our trade not only with Europe—whether we are members of the Common Market or not—but also, and perhaps even more significantly, with markets in the developing countries in Asia, South America and elsewhere, which are of major importance as providing growing outlets for our future trade. These countries lean towards the metric system rather than the inch/lb system. In view of this and despite the continuing importance of the U.S.A. and Commonwealth markets, a decision within a relatively short time in favour of a change, to be made over a defined

period, is increasingly advocated. Clearly the time required for a change would vary from industry to industry and would have to be planned and phased according to their needs, but it is only on the basis of a firm assumption of a general move, *which nothing less than a Government directive could induce*, that most individual industries could or would take any decisive action, or even discuss the problem realistically with their customers and suppliers. Only on this basis could replacement of tools and plant be planned economically.

Should Change be Dependent on Parallel Action by the U.S.A.?

A major question is whether a decision to change should be made dependent on parallel decisions by the inch-using Commonwealth countries and the U.S.A. with whom there has for long been close co-operation on basic engineering practice. Many of those who support a change in principle make this a condition; others argue the contrary and in particular suggest that we should not await a decision from the U.S.A. which, because of its relative self-sufficiency, can afford to go much more slowly than we can. There appears to be considerably greater interest in the matter in the U.S.A. now than for some time. Certainly it would be very desirable to have consultations with the U.S.A. and Commonwealth. Some Commonwealth countries are considering the possibility of a change and would welcome a clear view from the United Kingdom.

Education for the Metric System

One of the first essential steps in making a change would be the encouragement of metric and decimal thinking. This would be one result of any early decision to adopt a decimal coinage which should be followed promptly by an appropriate education programme. One consequent measure which might follow quickly would be the use of parallel inch/lb and metric scales *in new* weighing and measuring equipment and similarly, of course, of inch/lb and metric measures in relevant British Standards.

Considerations Relevant to B.S.I. Action

There are a number of considerations to be borne in mind in determining the action to be taken by the B.S.I. on the assumption of a change :

(*a*) Some British Standards—for example, where tolerances are wide—could be expressed in the metric system by simple conversion, without altering significantly the methods of manufacture; these would be the first to change. Particular efforts could be made to secure in international standards committees a single series of sizes in such cases.

Nevertheless it is clear that in many cases a change to metric units, if it is to achieve its objective, will involve changes in sizes and in engineering design, as well as extensive retooling. In such cases the standards and the industries concerned could only change over a much longer period.

(*b*) In mechanical engineering it is not infrequently the case that the greater technical experience is in inches, and inch standards are more developed and complete than metric standards; some are also common practice between the United Kingdom, U.S.A. and Canada. It is accepted that at the present time there are a number of cases where no internationally agreed metric standards exist, but there is an accelerating programme to secure them.

(*c*) On the other hand there are performance and quality standards accepted by metric countries to which this country must approximate more closely if we are not to lose trade; it is argued that the use of metric dimensions will help towards this and that also we shall be in a better position to influence the international agreement if we are talking in metric terms.

Action by B.S.I.

The action to be taken by B.S.I., on the assumption of a change to the metric system within, say, 15 to 20 years, would be on the lines indicated below; some of the steps will in any event be called for in relation to the increasing use of metric measures by some sections of industry and the proposals should be looked at with that in mind.

(1) A plan for the translation of British Standards into the metric system would be drawn up (*see* the preliminary study, relating action by B.S.I. to the general sequence of change.)

(2) Greater efforts would be made to secure a single international recommendation for dimensional series, even if this meant in some cases acceptance of a metric series. The corresponding sizes recommended by the Committee* on Scientific Principles of Standardization, as finally agreed, would be pressed for whenever they had a chance of being acceptable. Other countries should be reminded that their co-operation towards reaching agreement on such series would make a general change by the United Kingdom more rapid and would help all round. Agreement in the international standards bodies might be facilitated by putting a target date for implementation a few years ahead.

(3) Where two series now exist in international recommendations B.S.I would publish the metric series as a British Standard as well as the inch series, for use by those who wished to work to metric in a transitional period.

(4) In other cases where metric standards are urgently needed in particular industries they would be prepared and issued as a matter of priority.

(5) In the first stage British Standard not issued in fully metric form would show metric as well as inch/lb values; some more precise conversion might be required than is at present the practice.

*An advisory committee of the International Organisation for Standardization (ISO).

PRELIMINARY STUDY

(The following, which is an appendix to the Statement as published, is a preliminary study of the action which might be taken over 20 years.)

Many differing views have been expressed as to the time that would be needed to effect a substantial change-over to a fully metric system. Periods as widely separated as 5 years and 50 years have been suggested as the minimum time in which such a change could be effected and there may be some merit in examining a tentative time-table for the various stages that would have to be gone through. To do this it is necessary to fix some time period and a figure of 20 years has been taken to see how far the necessary stages could be fitted into such a period

Years 0—3 The movement would have to be triggered off by a Government pronouncement and this would be preceded and followed by many top level consultations amongst leading industrial bodies, consultative councils and the like. Educational authorities, professional societies and institutions, trade unions, trade associations, chambers of commerce and many others would need to be brought into these consultations; a period of three years is allowed for this preliminary work of initiating the change and preparing a national plan for it to be effected smoothly.

Years 3—5 Once the initial decisions had been taken at national level and an overall skeleton plan prepared, the way would be clear for major groups and bodies, and later for individual companies, to work out their own programme within the overall plan. A period of two years is provided for this planning.

Years 3—5 Meanwhile stocks would be allowed to run down, dates would be set for terminating near-to-obsolescent lines of manufacture and some new designs would be initiated in metric dimensions.

Years 0—3 Parallel with all this the B.S.I. would be considering the formidable task of revising say 1,500 B.S., most of which would be needed in their new form (N.B.S.) before industry could make a real start in changing over their production. Some preliminary planning by B.S.I. would clearly be essential and a period of three years is allowed for this.

The revision of standards would raise other awkward problems, for example: is a $\frac{3}{4}$ in long object to be redefined as an exact conversion 19·05 mm, as a rounded figure 19 mm, or as a more conventional metric figure 20 mm ? Problems such as this would arise not once but many times in every single British Standard to be revised. Though some general rules for revision could be framed, most of these decisions would have to be taken individually on their merits.

Years 3—5 Considerable additional staff would have to be recruited and trained by B.S.I. and the experience of the Indian Standards Institution would give a valuable clue as to the size of staff needed and the time required to get the revisions under way. A period of a further two years is allowed for this.

Years 5—15 At the end of the first 5-year period it is assumed that the movement is well under way and a further 10 years is allowed to complete the task of revising the whole 1,500 or more B.S. which include dimensional data.

Years 5—10 Concurrently industry would be tackling the problem vigorously. By the end of the first five-year period there would be some N.B.S. available—few industries would get very far until the appropriate N.B.S. were published. New metric designs

would be coming forward and some of the commoner components would be available in metric dimensions for incorporation in the new designs. Market research would have revealed how far trade conditions called for a vigorous policy or a policy of more gradual change.

Years 10—15 In the 10th-15th year period production in metric dimensions would be gaining momentum. Many of the commoner components would now be available in metric form and N.B.S. would be available for most products.

Years 15—20 The final period from the 15th-20th year would be the time to take stock of the position and to note how far the movement had progressed. This is an irreversible movement, so efforts would now have to be made from Government levels downwards to convince laggards that they must move with the times. A date should be set for making inch measure non-preferred.

TENTATIVE 20-YEAR PROGRAMME

	Years
Preparation of Policy	
Government pronouncement	0
Industrial consultations and planning	0——3
Revision of education programme (with necessary reprinting) and implementation	1———4
Technical literature, handbook, data sheets, charts, etc., reprinted and on sale	2——5
New measuring instruments, dials, gauges, become available or old ones are converted	2——4
B.S.I. Programme	
Formulation of general policy and programme	0——3
Major revision commences	3——
Revision substantially complete	————15
Industrial Action	
Stocks run down, detailed planning, etc.	3——5
New designs coming forward	5——
N.B.S. becoming available	———5
New components becoming available	————10
Metric production gathering momentum	10——15
Efforts to expedite the movement and to eliminate old units.	15———20

CHANGE TO METRIC STANDARDS ?

Delegates had before them the newly-published B.S.I. leaflet, 'Change to the metric system ?'* and Mr. T.R.B. Sanders (B.S.I.'s engineering adviser), introducing a discussion on this statement, made it clear that neither he nor the B.S.I. was advocating a move for or against such a change. The object of issuing the leaflet was to provoke discussion within industry.

'It is, however, an undoubted fact that more and more people are beginning to think that some change is inevitable,' he continued. Factors leading to this kind of thinking were our possible entry to the European Common Market, plus the fact that the developing countries of Africa, Asia and South America

*Text published above.

looked to metric measures in developing their standards. Certainly it was felt that the prospects for our export trade would be enhanced if we were to go metric.

Looking at the pros and cons, Mr. Sanders emphasized, 'It has not yet been proved that we should necessarily sell our goods abroad more easily just because they were made in millimetres. Other factors such as quality and after-sales service might well be much more important'.

There was the question of whether action in the U.K. should be dependent on a parallel change in the United States. Certainly there was no indication yet of any serious general move to the metric system on the other side of the Atlantic.

So far as Commonwealth countries were concerned, though India would welcome Britain going metric, such countries as Canada, Australia and New Zealand would be loath to see any departure from the degree of standardization which had been achieved with the United States through A.B.C.—America, Britain, Canada—standards co-operation.

'What we need most at the present time is leadership', Mr. Sanders averred. But he saw little likelihood of Government guidance in the immediate future.

He suggested that the next stage should be for each industry and each company within an industry to examine the problems objectively to see how they were affected. All B.S.I.'s major committees were being invited to give consideration to the questions posed in the new pamphlet. In the light of their response, it might perhaps be possible to produce a better pamphlet, one with more definite proposals in time for next year's conference.

Mr. Sanders went on to say that even if we were to go metric it was not always the case, particularly in mechanical engineering, that suitable Continental standards existed. Sometimes there were several Continental standards and choosing even the best of these might still mean giving up a great deal of good practice contained in Anglo-Saxon techniques.

Should there be a decision in favour of a change it would of necessity be a very gradual change with the rate of progress varying from industry to industry.

Meanwhile, he wondered whether more could not be done to promote the adoption of 'corresponding' inch-metric sizes in cases where tolerances were reasonably large. Criticism in Britain of such a development was directed mainly against the proposals where tolerances had to be very tight.

In the discussion which followed a Netherlands delegate, Mr. van Rooij (senior standards engineer, Philips Electrical Industries Ltd.,) said that standardization of necessity meant a sacrifice on many occasions. He put forward a plea for Britain to go metric as a contribution towards European unity.

But Mr. Orton (Stewarts and Lloyds Ltd.) thought that when the B.S.I. pamphlet spoke of an increasing volume of opinion favouring a change to the metric system, what was really meant was the 'volume of noise' of pro-metric supporters.

From Mr. A. J. Wilde (regional standardization engineer, Central Electricity Board) came the view that our entry into the European Common Market would not be nearly such a leisurely business as had been suggested. 'We will have to sell a lot more to Europe and this will mean working to European standards which are based on the metric system. Events may overtake us unless we take prior action,' he warned.

From Mr. A. C. Hutchinson (engineering consultant, W. Allen Sons & Co. Ltd)

came what he termed 'a spanner in the works', since he maintained that from the engineering viewpoint there was no such thing as a single metric system. B. S. 350 listed conversion factors in no fewer than four different metric systems.

In reply, another Netherlands delegate contributed the information that the 'official' metric system now being adopted on the Continent was the MKS (metre, kilogramme, second) system.

Support for the metric system came from Mr. W. J. Robinson (standards engineer, Rubery Owen & Co. Ltd.) while Dr. M.A. Champney (chief quality engineer, De Havilland Aircraft Co. Ltd.) pointed to the fact that the pharmaceutical and large sections of the chemical industry in general had already gone over to the MKS system. Mr. C.A.J. Martin (executive director, Crompton Parkinson Ltd.) doubted whether we should wait for a lead from the United States and Commonwealth—they were probably waiting for a lead from us.

Mr. Sanders, replying, said that one thing we certainly could not afford, whether or not we went metric, was two sets of inch measurements. He pointed out, in conclusion, that firms which would not be able to go metric if the United States did not change were those making American machinery—such as earth-moving equipment —under licence from American firms.

News and Views

Recent Notifications

(1) *Ports and Shipping*

S.O. No. 2376 dated 24th July, 1962.

In exercise of the powers conferred by section 14 of the Standards of Weights and Measures Act, 1956 (89 of 1956), the Central Government hereby makes the following amendment in the notification of the Government of India in the Ministry of Commerce and Industry No. S.O. 1899, dated the 1st August 1960 (relating to the permission of the continuance of the use of any weight or measure which immediately before the 1st August, 1960 was in use in respect of ports and shipping industry), namely :—

In the said notification, for the words 'for a period of two years', the words 'for a period of three years' shall be substituted.

(2) *Capacity Measures in Jammu & Kashmir*

S.O. 2374 dated 24th July, 1962.

In exercise of the powers conferred by subsection (3) of section 1 of the Standards of Weights and Measures Act, 1956 (89 of 1956), the Central Government hereby appoints 1st day of August, 1962 as the date on which the provisions of the said Act in so far as they relate to units of capacity shall come into force in all the areas in the State of Jammu and Kashmir except in those classes of undertakings or those classes of goods in respect of which the said provisions have already come into force.

S.O. 2375 dated 24th July, 1962.

In exercise of the powers conferred by section 14 of the Standards of Weights and Measures Act, 1956 (89 of 1956) the Central Government hereby permits, in all the areas in the State of Jammu and Kashmir referred to in the notification of the Government of India in the Ministry of Commerce and Industry No. S.O. 2374 dated the 24th July, 1962 except in respect of the classes of undertakings and goods referred to in that notification, the continuance of the use, for a period of one year from the 1st day of August, 1962 of any unit of capacity which, immediately before that day, was in use in the State of Jammu and Kashmir.

A Stainless Steel for Standard Weights

The '*National Bureau of Standards Technical News Bulletin*' (March 1962, page 49), has published the following information regarding stainless steel which could be used for standard weights :

For many years brass has been used as the principal material for the standard weights maintained by the various States as reference standards. Brass is non-magnetic—a prime requisite—and it has a density of 8·4 g/cm³, the weight per unit volume long established in this country for standards of mass. However, it is not an ideal material since it tarnishes and is thus subject to changes in weight. A study has therefore been made at the Bureau to develop a nontarnishable alloy for physical standards of mass.*

In the study, conducted by S. J. Rosenberg and T. P. Royston of the thermal metallurgy laboratory, it was recognized that commercial austenitic stainless steel—which is highly corrosion-resistant—could meet the non-magnetic but not the density requirement, since its weight per unit volume is about 7·9 g/cm³. Of the various heavy elements that might increase the density, tungsten appeared the most promising, even though it could promote the formation of ferrite and hence cause an undesirable increase in permeability. It was anticipated, however, that austenite stability could be maintained by using steels containing a 2-to-1 ratio of nickel and chromium.

In the experiments, several stainless steels of this composition were combined with tungsten by melting in a laboratory induction furnace, and the metal was poured in the form of 1·5-in.-diam. bars. A 4-hr homogenizing annealing treatment at 2,000°F preceded hot working by forging and swaging, in which rods of 0·6 in. diameter were produced. The rods were then cut into 6 in. long specimens for chemical and spectrochemical analysis.

The results of the analysis showed that one of the steels had the characteristics desired for standard weights. Its principal constituents, in percentages by weight, are as follows : carbon 0·09; manganese 1·7; silicon 1·55; nickel 32·4; chromium 16·2; tungsten 9·9. The density of this steel as hot worked is 8·42 g/cm³ and its magnetic permeability is 1·008.

After this work was initiated, international proposals were made to set the density of mass standards at 8·0 g/cm³. A steel of this density, having the other characteristics necessary for reference standards, has recently been produced commercially. It is now being investigated for possible future use, should the 8·0 g/cm³ density criterion eventually be adopted.

* For further technical details, see *A stainless steel for standard weights* by S. J. Rosenberg and T. P. Royston, ASTM Materials, Research and Standards 1, 21 (1961).

Special Session for Training and Education of Engineers in Metric System

Under the Standards of Weights and Measures Act, 1956, metric system is being progressively introduced in various fields in the country. Metric weights are already compulsory throughout the country, and by the end of 1963 only the metric units of weights, capacity and length would be legal in the whole of India.

Metric system has been adopted by various undertakings, both in public and private sectors. In the field of engineering, however, the change-over to the new system has to be gradual and carefully planned. For this, there is an imperative need for education and training of engineers so as to effect a smooth change-over in planning, designing and production.

Metric system has not yet found its appropriate place in technical and engineering education, but more and more attention is now being paid to this important aspect of the metric reform. At a conference called by the Union Ministry of Commerce and Industry, the question of adopting metric system in higher technical education was fully discussed by the Principals of technical institutions in India and it was unanimously recommended that the metric system be introduced in higher technical education by stages so as to complete the change-over by the end of 1964-65.

With a view to highlighting the importance of training and education of engineers in metric system in disseminating information on the subject, the Indian Standards Institution has decided to hold a Technical Session entitled 'Training and Education of Engineers in Metric System (S-9)' during the Seventh Indian Standards Convention to be held at Calcutta from 28 January to 2 February 1963. About 500 delegates consisting of engineers, technologists, scientists and research workers, business executives, policy makers and others concerned, drawn from industry and trade, research, technological and engineering institutions, Government departments and others are expected to participate in the Session.

The Technical Session will discuss important subjects related to training and education of engineers in metric system, including among others, conversion of curricula to metric system, writing and publishing of new textbooks, re-editing of old books and teaching notes. Discussions will also take place on the need for training engineers and teachers of engineering to think in metric terms, to become familiar with metric materials, and adept in the use of designs, codes, methods of conversion, etc. and on ways and means of promoting such training.

The following topics will illustrate the scope of the Session :

(*i*) Adoption of metric system in engineering education.

(*ii*) The problem of textbooks in metric system.

(*iii*) In-plant training programmes for engineering and supervisory personnel, particularly those engaged in design offices.

(*iv*) Standard specifications and availability of metric materials, tools, etc.

(*v*) Conversion of designs to metric system.

Organisations and individuals interested in the subject are invited to attend the Session and to contribute original and thought-provoking papers not exceeding 2,500 words.

(Indian Standards which have a particular bearing on the change-over to the metric system are indicated here. Copies would be available from the Indian Standards Institution, Manak Bhavan, 9 Mathura Road, New Delhi or their Branch Offices at Bombay, Calcutta, Madras and Kanpur.)

Indian Standards for Slotted Countersunk Head Machine Screws (IS : 1365—1962).

The Indian Standards Institution has published an Indian Standard Specification for Slotted Countersunk Head Machine Screws (1·6 to 20 mm) IS : 1365—1962, which covers the requirements of countersunk head machine screws of diameter range 1·6 to 20 mm for coarse and fine pitches.

The metric screw thread system with ISO profile has been recognized in India. All threaded fasteners, particularly those required in the engineering industry for general applications shall consequently, have the metric screw thread. To meet the immediate demands of the industry, the Institution is engaged in preparing specifications for the more common types of threaded fasteners. The screws of the cheese and round head type form subject of a separate specification.

Price : Rs. 2·00

Indian Standard for Metric Diagonal Scale (IS : 1562—1962).

The Indian Standards Institution has issued a series of specifications on metric scales with a view to helping the cartographers, surveyors and engineers for changing to the metric system. The Indian Standard Specification for Metric Diagonal Scales (IS : 1562—1962) is fifth in the series. The following four standards covering metric scales have already been published ;

IS : 1480—1960 Metric Scales for General Purposes

IS : 1481—1961 Metric Steel Scales for Engineers.

IS : 1482—1960 Metric Scales for Use with Drafting Machines

IS : 1491—1959 Metric Scales for Architectural Purposes.

This standard deals with metric diagonal scales used for measuring or setting off distances upon geometrical and other drawings, maps, plans, etc. with correctness aimed at upto one-hundredth part of a millimetre.

Price : Rs. 3·00

Indian Standard for Aluminium Milk Cans (IS : 1825—1961).

The Indian Standards Institution has published an Indian Standard Specification for Aluminium Milk Cans (IS: 1825—1961), which prescribes the requirements for aluminium milk cans of a rated capacity of 10, 20, 30, 40 and 50 litres for collection and distribution of fluid milk.

An ideal milk can has to be designed in such a way that it should transport its contents safely without spillage and with minimum of churning. It should also withstand rough handling, occupy minimum of space on trucks or lorries, allow a high degree of sterilization and should also facilitate cleaning. Further it should be light and durable. This standard has been drawn up giving due consideration to all these points.

Metric system has been adopted in India and all quantities and dimensions appearing in this standard have been given in this system.

Price : Rs. 2·50

Indian Standard for Rolling and Cutting Tolerances for Hot Rolled Steel Products (IS : 1852—1962).

The Indian Standards Institution has just published an Indian Standard Specification for Rolling and Cutting Tolerances for Hot Rolled Steel Products (IS: 1852—1962). The standard lays down rolling tolerances for structural steel sections including beams, channels, angles, tee bars and bulb angles; bars other than rivet bar; flats; plate and strip: cutting tolerances for plate, strip and other hot rolled steel products have also been specified.

Tolerances for metal products followed in this country hitherto are based mostly on the British practice. It was felt that more detailed tolerances were necessary especially in view of the decision of the Government of India to adopt the metric system of weights and measures. The formulation of this new standard for tolerances coinciding as it does with the production of structural sections and other steel products in metric dimensions is most opportune. All quantities and dimensions in this standard have been given in this system.

Price : Rs. 3·50

Indian Standard for Aluminium Doors, Windows and Ventilators (IS : 1948—1961).

The Indian Standards Institution has published an Indian Standard Specification for Aluminium Doors, Windows and Ventilators (IS : 1948—1961). The Standard covers the requirements regarding material, fabrication and dimensions of aluminium doors, windows and ventilators manufactured from extruded aluminium alloy sections of standard sizes and designs, complete with fittings, ready for being fixed into the buildings.

The sizes of aluminium doors, windows and ventilators and other requirements and details specified in the standard are identical to those of steel doors, windows and ventilators, an Indian Standard for which has already been published.

Price : Rs. 5·00

Indian Standard for Plain Washers (IS : 2016—1962).

The Indian Standards Institution has published an Indian Standard Specification for Plain Washers (IS : 2016—1962), which deals with plain washers of the following types:

(*a*) Machined washers, for precision and turned grade hexagonal bolts and screws,

(*b*) Punched washers for hexagonal head, screws and bolts, and

(*c*) Punched washers for round and cheese head screws.

Following the recognition of the metric secrew thread with ISO profile, the Indian Standards Institution is making available standards on screw threads, bolts, nuts and accessories. The commonly used plain washers have been covered in this standard. Spring washers and other special types will be covered by a separate specification.

Metric system has been adopted in India and all values which appear in this standard have been expressed in this system.

Price : Rs. 2·00

Draft Indian Standard for Straight Sided Splines for General Engineering Use.

With a view to rationalize the production and to ensure the interchangeability of straight sided splined shafts and hubs used extensively in automobile and other industries, the Indian Standards Institution has prepared a draft Indian Standard Dimensions for Straight Sided Splines for General Engineering Use.

This draft standard covers the dimensions and tolerances of 6, 8 and 10 equi-spaced straight sided splines for general engineering use, for shaft diameter range 11—125 mm in light and medium duty series.

The draft will be circulated shortly, for eliciting technical comments.

Revised Indian Standard for Tee and Strap Hinges (IS : 206—1962).

The Indian Standards Institution has published a revision of the Indian Standard Specification for Tee and Strap Hinges (IS : 206—1962), which lays down requirements for material, manufacture, dimensions and finish of mild steel tee and strap hinges that are commonly used in general building construction.

This standard was first issued in 1950 as tentative standard and was made firm in 1956. Consequent upon the adoption of metric system of weights and measures by the Government of India, the standard has now been revised specifying various dimensions of tee and strap hinges in metric units. To cater for special needs of the consumers, two more classes of tee hinges, has been introduced in this revision.

Price : Rs. 2·00

Revised Indian Standard for Wood Screws (IS : 451—1961).

The Indian Standards Institution has published a revision of the Indian Standard Specification for Wood Screws (IS : 451—1961) which covers mild steel and brass wood screws used in buildings and furniture, and for other general purposes.

This standard was first published in 1953 specifying dimensions and other requirements of wood screws in fps system. Consequent on the adoption of metric system of weights and measures by the Government of India, this standard has now been revised specifying sizes of wood screws in metric system, in order to enable the wood screw manufacturers to change-over smoothly to the metric system by 1966.

Price : Rs. 2·50

Revised Indian Standard for Mild-Steel Wire Nails (IS : 723—1961).

The Indian Standards Institution has published the revision of Indian Standard Specification for Mild Steel Wire Nails (IS : 723—1961). The standard specifies the dimensions and tolerances of mild steel round wire nails of the following types with suitable illustrations:

(*a*) Plain head nails
(*b*) Lost head nails (lost head brads)
(*c*) Clout, slate or felt nails
(*d*) Extra large head felt nails
(*e*) Roofing nails (convex head, chisel point)
(*f*) Panel pins
(*g*) Lath nails
(*h*) Wall nails
(*j*) Cut-lath nails (cut tacks)
(*k*) Round wire dowells with double diamond points (dowell pins).

This standard was first issued in 1956 specifying the shank diameters of different types of mild steel wire nails in SWG, lengths in inches and packing requirements in pounds. In the revised version the shank diameters and lengths have been specified in millimetres and the packing requirements in kilograms.

Draft Indian Standard for Bright Bars for Threaded Components [Doc : SMDC 1 (353)].

The Indian Standards Institution has prepared a draft Indian Standard Specification for Bright Bars for Threaded Components, Doc: SMDC 1(353).

This draft standard prescribes the sizes and tolerances of bright bars for the manufacture of threaded components.

While special consideration has been given to cover round and hexagonal bright bars required for the threaded fastener industry, the requirements regarding square bars have not been included in the draft specification as they are not used in the threaded fastener industry to any appreciable quantities.

This draft standard (which is in English) will be circulated shortly for comments.

Draft Indian Standard for Structural Quality Hot Rolled Carbon Steel Sheet and Strip [Doc : SMDC 5 (372)]

The Indian Standards Institution has prepared a draft for Structural Quality Hot Rolled Carbon Steel Sheet and Strip; Doc: SMDC 5(372) Revision of IS: 1079—1958.

This standard was first issued in 1958. The modifications made in the revised draft relate to the inclusion of two more grades of steel and designation of steel according to IS: 1762—1961 Code for Designation of Steel. Besides, all dimensions and quantities appearing in this revised standard, have been given in metric system.

The draft standard covers the requirements for five grades of hot rolled carbon steel sheet and strip intended for the manufacture of cold formed structural members and for other general engineering purposes. The five grades are designated as 0—1079, St 34—1079, St 42—1079, St 50—1079 and St 52—1079 respectively. The grades St 34—1079, St 42—1079 and St 50—1079 (surface descaled) included in the draft are of guaranteed weldable quality. For spot welding, only St 34—1079 steel is recommended as spot welding becomes increasingly difficult with carbon in excess of 0.15 per cent.

Indian Standard for Cold Rolled Plain Carbon Steel Sheets [Doc. : SMDC 5 (387)]

The Indian Standards Institution has prepared a draft for Cold Rolled Plain Carbon Steel Sheets; Doc: SMDC 5(387)—Revision of IS: 513—1954.

This standard was first issued in 1954 as a tentative Indian Standard. The main modification made in the draft revision relates to the inclusion of two additional types of steel sheets in order to cater to the requirements for rapid industrial development in the country. Extra deep drawing quality steel sheets, which are now being used considerably in the automobile and other industries, have also been covered in the revised draft. Besides, all dimensions and quantities appearing in this revised draft have been given in the metric system.

The draft standard covers the requirements for cold rolled plain carbon steel sheets required for panelling, enamelling, deep drawing and for general engineering purposes. All types of sheets included in this standard are of guaranteed weldable quality and are suitable both for fusion and spot welding.

The draft revision provides for cold rolled steel sheets to be supplied in any of the three finishes, *viz.*, dull, smooth and bright. As separate Indian Standard Specifications for Galvanized Steel Sheet (Plain and Corrugated) (IS : 277—1951) and Black Plate for Tinning and Tinplate (IS: 597—1955) have already been published, galvanized and tinned finishes have been excluded during revision.

As special qualities of steel sheets are available in a variety of types and finishes, the purchaser can get the best type of material by furnishing the manufacturer with the fullest possible information on the purpose for which the sheets are required. The information will generally be of assistance to the manufacturer in deciding the type and finish most suitable for a specified purposes.

This draft standard (which is in English) will be circulated shortly for eliciting technical comments.

Draft Indian Standard for Steel Tubes for Automobile Cycle and Motor Cycle Purposes [Doc. : SMDC 22 (316) and 22(317)]

The Indian Standards Institution has prepared the following draft Indian Standard Specifications:

(*i*) Steel Tubes for Automobile Purposes, Doc: SMDC 22(316)

(*ii*) Steel Tubes for Cycle and Motor Cycle Purposes, Doc: SMDC 22 (317)

These draft Standards prescribe the requirements for the following three types of tubes:

(*a*) Cold Drawn Seamless Steel Tubes (CDS).

(*b*) Electric Resistance Butt-Welded Steel Tubes (ERW), and

(*c*) Cold Drawn Electric Resistance Butt-Welded Steel Tubes (CEW).

When finalized, these Standards will considerably assist the indigenous production of steel tubes, the demand for which has greatly increased with the rapid rise in the production of cycles and automobiles in this country.

These draft standards (which are in English) will be circulated shortly for eliciting technical comments.

CORRECTIONS

Please refer to Tables for *Cloth Requirements in Metric Terms* appearing on pages 13—23 of May 1962 issue of *Metric Measures*. The following corrections may please be incorporated:

Table I Cloth Requirements for Men's Apparel

(1) Item 5 Trousers (Cotton) in Col. 4 for 1·44 please read 1·49, and in Col. 5 for 1·45 please read 1·50

(2) Item 13 Bush-Shirts, Manila etc., Col. 4 for 1·83 please read 2·29, and in Col. 5 for 1·85 please read 2·30

(3) Item 15 Turban, in Col. 4 for 6·49 please read 6·40

Table II—Cloth Requirements for Women's Apparel

(4) Item 3 Sarees, in Col. 5 for 4·60 please read 4·50, in Col. 5 for 6·50 please read 5·50, in Col. 3 for 7(46"—48") please read 7(45"—48") and in Col. 5 against 7 yards for 7·25 please read 6·50

Table III—Ready Made Garments

(5) Item 3 Shirt, Collar, in Col. 4 for 34 please read 34·3, and in Col. 4 for 43 please read 43·2

(6) Item 11 Sola and Felt Hats, in Col. 4 for 18·1 please read 17·9, for 18·7 please read 18·1, for 19·1 please read 18·7, and for 20·3 please read 19·1.

(7) Item 12 Caps, in Col. 4 for 46 please read 45·7

(8) Item 15 Socks, in Col 4 for 26·8 please read 26·7

Boy's Wear

(9) Item 2 Half Pants, length, in Col. 4 for 30 please read 30.5

(10) Item 3 Shirts, neck, in Col. 4 for 30 please read 30·5

(11) Item 5 Socks, in Col. 3 for 6½ please read 6½.

Children's Wear

(12) Item 2 Baby's Rain Coat, in Col. 5 please delete 53

Table V—Miscellaneous Requirements

(13) Item 1 Durries, against size 12′×15′ for 3·75×5·50 m please read 3·75×4·50 m

(14) Item 2 Coir Carpets and Kalin and Rugs, against size 9′×9′ in Col. 5 for 3·75 please read 2·75, against size 9′×12′ in Col. 4 for 2·74×2·74 m read 2·74×3·66 m and against Col. 5 for 2·75×2·75 m please read 2·75×3·75 m.

(15) Item 6 Curtain cloth, width, in Col. 5, please read 118 cm, 120 cm, 122 cm for 118·5 cm, 120 cm, 122·5 cm.

(16) Item 9 Floorings, width, in Col. 5 for 100 cm please read 110 cm, and for 60 cm please read 50 m.

(17) Item 11 Leather Suitcases, width, 14″ in Col. 4 for 35·7 please read 35·6, and

(18) Against Depth 7″ in Col. 4 for 17·7 please read 17·8.

The letter published in *Readers' Forum* in the July 1962 issue of *Metric Measures* is by Shri H. L. Mehandru, Controller of Weights and Measures, Delhi.

In the Table of Abbreviations, please read cu cm as abbreviation for cubic centimetre, and 100 a for 100a² against hectare.

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Licensed Manufacturers, Dealers and Repairers of Weights and Measures (21)

METRIC Measures has been publishing a series of lists of manufacturers, dealers and repairers of weights and measures, weighing and measuring instruments licensed by the Governments in the various States and Union Territories under the Weights and Measures (Enforcement) Acts in their respective jurisdiction. This is the twentyfirst list; the first list appeared in the March, 1959 issue.

Progressively steps are being taken for licensing manufacturers, dealers and repairers in all States and further lists of licensees would be published in *Metric Measures* as this work progresses.

The number in brackets against the name of the State or Union Territory indicates the particular instalment number of the State or the Union Territory. The issues of the *Metric Measures* in which previous lists appear are also shown suitably.

An analysis of the licenses, including the present list, shows that the total number of licensees in 14 States and 5 Union Territories is 1,172 manufacturers, 4,707 dealers and 1,096 repairers. The details of published information are as follows:

Sl. No.	State/Union Territory	Licensees		
		Manufacturers	Dealers	Repairers
(1)	Andhra Pradesh	101	194	54
(2)	Assam ..	16	97	28
(3)	Bihar ..	20	69	34
(4)	*Delhi* ..	28	93	20
(5)	Gujarat ..	109	578	132
(6)	*Himachal Pradesh*	1	28	1
(7)	Kerala ..	40	489	116
(8)	Madhya Pradesh	115	496	9
(9)	Madras ..	79	828	126
(10)	Maharashtra	101	163	185
(11)	*Manipur* ..	14	85	5
(12)	Mysore ..	104	471	165
(13)	Orissa ..	87	17	3
(14)	*Pondicherry* .	2	12	2
(15)	Punjab ..	39	157	29
(16)	Rajasthan ..	43	206	44
(17)	*Tripura* ..	1	9	0
(18)	Uttar Pradesh	207	515	88
(19)	West Bengal	65	200	55
		1,172	4,707	1,096

ANDHRA (5)

In the September 1961 issue of Metric Measures, a list of licensed manufacturers, dealers and repairers of Weight and Measures for the year 1961 was published. The following is a list of manufacturers, dealers and repairers licensed for the year 1962 under the Andhra Pradesh Weights and Measures (Enforcement) Act 1958.

Manufacturers

Sl. No.	Name and Address of Manufacturer	Details of Articles Manufactured
(1)	Adabala Satyanarayana & Sons, Dowlaishwaram, E. Godavari.	Beam Scales.
(2)	Asian Industries (Prop. Mohd. Yousaf Qadri, 3-2-29/2 Niboli Adda Station Road, Kachiguda, Hyderabad.	Brass Weights.
(3)	Andhra Ratna Iron Foundry, Near Addanki Gate, Ongole, Guntur.	Cast Iron Weights.
(4)	Andhra Scientific Co. P. Ltd., Cantonment Road, Masulipatnam.	Bullion Weights and Weighing Instruments.
(5)	Asiatic Machinery Corporation P. Ltd., Howrah ..	Weighing Instruments.
(6)	Avery Co. of India P. Ltd., Hindi Road, Extension, Calcutta	Weights Measures, Weighing and Measuring Instruments.
(7)	Bharat Moulding (Partners, 1 M.M. Babu (2) Bharat Chand (3) Veer Malappa) 21-2-194, Charkaman Tanksal, Hyderabad.	Brass Weights.
(8	Baba Industries, Trunk Road, Cuddapah	Conical type measures.
(9)	Bharat National Foundry, Motia Khan, New Delhi	Cast Iron Weights.
(10)	Central Metal Works, Prop. Sri Serferaj Khan) 15-1-453, Feel Khana, Hyderabad.	Brass Weights & Measures.
(11)	Deccan Porcelan & Enamel Works, 2707, Bakaram, Mushirabad, Hyderabad.	Cast Iron Weights.
(12)	Durga Foundry Works, Kothawada, Warangal	Cast Iron Weights.
(13)	Federation & Industrial Cooperatives Ltd., Bachir Bagh, Hyderabad.	Land Measuring Chains
(14)	General Purpose Engg. Works, Shop. Tadepalligudam, W. Godavari.	Cast Iron Weights Bullion Weights.
(15)	Goyal Industries, Mon Bhavan, 3681, Sultan Ganj, Agra	Brass Weights.
(16)	Hyderabad Iron & Steel Works, P.B. No. 10, Industrial Area, Azamabad, Hyderabad.	Cast Iron Weights and Land Measuring.
(17)	S.K. Industries, Bakaram, Musheerabad, Hyderabad ..	Cast Iron Weights.
(18)	S. & P. Industries, Factory Units, Industrial Estate, Warangal	Cast Iron Weights.
(19)	India Iron Foundry, Sultan Ganj, Agra..	Cast Iron Weights.
(20)	S.K. Iron Foundry & Engg. Co., Rambagh, Agra . ..	Cast Iron Weights.
(21)	Jamsheed Iron & Steel Co , Siddiamber Bazar, Hyderabad ..	Conical Measures.
(22)	Jeevan Nagi & Sons, River Bank, Savarkondla	Beam Scales.
(23)	Jeevanlal (1929) Ltd., P. B. No. 1389, 127 Mint Street, Madras.	Dipping Type Capacity Measures.
(24)	Kanka Durga Iron Works, Jagannaikapur, Kakinada	Beam Scales.
(25)	Jaya Krishna Iron & Industrial Works, Dowlaishwaram .	Beam Scales.
(26)	L. Karson Ramji & Sons, Savarkondla	Beam Scales.
(27)	Luhar Jiva Gopal, Savarkondla Saurashtra, Gujarat ..	Beam Scales.
(28)	Luhar Mulji Naran, Savarkondla, Saurashtra .. .	Beam Scales.
(29)	Luhar Kanji Ranchod, Siddipura, Savarkondla	Beam Scales.
(30)	Misrilal Motilal, Topkhana Qadeem, Osmangunj, Hyderabad	Brass Weights, Linear Measures & Weighing Instruments.
(31)	Marwadi Moulding Factory, Kasaratta Road, Hyderabad ..	Cylindrical Dipping Type Measures.

Manufacturers *(Contd.)*

Sl. No.	Name and Address of Manufacturers	Details of Articles Manufactured
(32)	A. M. Master & Co., Janjikar Street, Bombay	Beam Scales & Counter Machines.
(33)	Majestic Metal Works, Mittikasher, Begum Nazar, Hyderabad	Brass Weights & Measures.
(34)	Mighty Scales Co., Kuranchery, Wada, Kancheri Railway Station, Kerala.	Platform Weighing Scales.
(35)	National Metal Industries, 15-A Parel Village Road, Parel, Bombay.	Cylindrical Type Measures.
(36)	Oriental Metal Pressing Works, 131, Worli, Bombay ..	Weights, Measures, Weighing & Measuring Instruments.
(37)	Pappu Veeranna & Sons, Dowlaishwaram, E.G.	Cast Iron Weights & Beam Scales.
(38)	Pandu Ranga Engineering & Moulding Works, Railway Feeder Road, Tadepatri, Ananthapur.	Cast Iron Weights.
(39)	Raiz & Brothers, 134—138, Near Post Office, Sadar Bazaar, Delhi-6.	Brass Weights, Scales, Platform Machines, Counter Scales.
(40)	Shree Ranganayaka Iron Works, Dowlaishwaram, E. Godavari	Beam Scales.
(41)	Raj Kamal & Co., Bombay, Kumarwada 4th Lane, Bombay	Beam Scales, Counter Scales & Length Measures.
(42)	Star Metal Works, Joshiwada, Raja Dhan Rajgriji Meth, Begum Bazar, Hyderabad.	Measures.
(43)	Seetarama Engg. Works, Dowlaishwaram, E. Godavari ..	Beam Scales.
(44)	Shree Krishna Iron Works, Dowlaishwaram, E. Godavari ..	Beam Scales.
(45)	Swamy Alivelu Industries, Lakkavaram Post, Razole, E.G.	Weights.
(46)	Sadanand Engineering Works, 19/1 Industrial Areas, Azamabad, Hyderabad.	Beam Scales.
(47)	Safe Scale Co., 22-6-257, Kali Kaman, Hyderabad ..	Brass Weights.
(48)	Surya Engineering Works, Industrial Estate, Warangal ..	Cast Iron Weights.
(49)	Sivarama Engineering Works, P B. No. 116, Sangadigunta, Guntur.	Iron Weights.
(50)	Standard Foundries (Prop. K. N. Vithavi) P.B. No. 16, Nizamabad.	Cast Iron Weights
(51)	Scientific Engineering Home P. Ltd., Bashir Bagh, Hyderabad	Land Measuring Chains.
(52)	Swami Engineering Works, Dowlaishwaram, E. Godavari .	Beam Scales.
(53)	Saraswathi Iron Balance Works, Dowlaishwaram, E. Godavari	Beam Scales.
(54)	Shanta Vijaya Chain Factory, Pandyala Street, Savarkondla	Beam Scales.
(55)	Shree Ram Mills Ltd., Fergusson Road, Lower Parel, Bombay-13.	'SRM' Cast Iron Weights.
(56)	Taj Industries (Prop. Mohd. Jamaluddeen) 5-5-274/7 Behind Gandhi Bhavan, Nampalli, Hyderabad	Brass Weights and Conical Type Measures.
(57)	Technical Appliance Co., 16-7-739, Osmanpura, Hyderabad	Land Measuring Chains.
(58)	Venkateswara Iron Works, Dowlaishwaram, E. Godavari ..	Beam Scales.
(59)	Venkateswara Light Casting Works, 1-7-176, Bakaram Hyderabad.	Cast Iron Weights.
(60)	D. L. Vaid, 202, Cutlery Bazar, Bombay-3	Beam Scales.
(61)	Watan Weight Works, Behind Canara Bank, Pathargatti, Hyderabad.	Brass Weights & Metre Measures and Counter Scales.

Dealers

(1) The Avery Co. of India P. Ltd., 889, Post Office Road, Hyderabad.

(2) Arvapalli Balakrishna Ega, Ramula, Kaman Bazaar, Khammam.

(3) S. K. Abdul Wahab, Wahab Chowk, Tenali (Guntur Dist.).

(4) Abdul Kareem Maniyar, Iron Fabricator & Hardware Merchant, Adoni, Kurnool.

(5) Annavarapu Rana Subba Rao, Gopal Reddy Street, Main Road, Tenali.

(6) Amara Purshotham, B. Venkata Rao & Co., Post Box No. 105, Morispet, Tenali (Guntur Dt.).

Dealers *(Contd.)*

(7) N Abdul Aziz Sons, Main Bazaar, Adoni (Kurnool).

(8) Andhra Scientific Company, Cantonment Road, Masulipatnam.

(9) Bangaruvenkata Suryanarayana Rao, Main Road, Palkot, West Godavari Dt.

(10) K. Baswaraju, Railway Feeder Road, Yellamanchelli, Visakhapatnam Dt.

(11) Baba Industries, Post Box No. 62, Christian Lane, Cuddapah.

(12) Bandalapalli Lakshminarayana Setty Sons, Iron & Steel Merchants, Dharmavaram, Ananthapur Dt.

(13) Battula Jagga Rao Sons, Nalam Bheemaraju Street, Rajahmundry, E. Godavari Dt.

(14) Bethireddy Gani Reddy, Todd Market, Tadepalligudam, West Godavari District.

(15) Central Metal Works, 15-1-457, Feel Khana, Hyderabad.

(16) Chunduru Gopalakrishna Murthy, General Merchants, Main Bazaar, Repalli, Guntur Dt.

(17) Chittuluru Pedda Venkata Subbaiah and Co., Rasool Bazaar, Kurnool Dt.

(18) Cheetirala Subba Ramaiah Gupta, Main Bazaar, Proddutur, Cuddapah Dt.

(19) The City Central Fancy Stores, Main Road, Rajahmundry, East Godavari.

(20) Colluru Venkanna & Sons, Timber Tiles, Hardware Merchant, Visakhapatnam.

(21) Deccan Porcelain and Enamel Works Ltd., 2707, Bakaram Musheerabad, Hyderabad.

(22) Dawood Baig Sahib, No. 58, Pattabhi Market, Masulipatnam, Krishna Dt.

(23) Donty Govindaiah, Suryanarayana & Brothers, Hindu Pur, Anantapur.

(24) Everest Company, (Prop. Harigopal Mundra), Kumar Galli, Nizamabad.

(25) The Federation of Industrial Cooperatives Ltd., Bashir Bagh, Hyderabad.

(26) Gudivada Bhavannarayana, Hazariwari Street, Guntur.

(27) Grandhi Chenchayya, Kotla Bazar, Chirola, Guntur Dt.

(28) Grandhi Maridayya & Sons, Main Road, Anakapalli P.O., Visakhapatnam Dt.

(29) Gelli Krishna Murthee Fir, Main Road, Vijayawada, Krishna Dt.

(30) I.A.E.C. Hyderabad Ltd., Gunfoundry, Hyderabad

(31) Hardware Merchant Prop. Chitkeshahvisanadha Narsimlu, Bada Bazaar, Nirmal

(32) S. K. Industries, Begum Bazaar, Mittika Sher, Hyderabad.

(33) Jamsheed Iron and Steel Company, Siddiamber Bazaar, Hyderabad.

(34) Konduri Veerabadhra Rao, Tadepalli, Gudem, West Godavari.

(35) Kesari Hardware Stores, Tilak Road, Gudivada, Krishna Dist.

(36) K. Jagannadha Rao, Hardware & Paint Merchant, Main Road, Visakhapatnam.

(37) Khaja Muslehuddink, Old Beat Bazaar, Warangal.

(38) Janyavula Ramachandra Rao & Co., Powerpet, Elore, W. Godavari.

(39) Janta Dealers (Prop. Mohd. Yousuf Hussain), Siddipet.

(40) Jeewanlal (1929) Ltd., 127, Mint Street, P.B. No. 1389, Madras.

(41) Kota Pullaiah & Sons, 23-12-51, Hazariwari Street, Guntur Dt.

(42) K. Krishna Murthy, Old Beat Bazaar, Warangal.

(43) Karana Venkatchalam, Main Bazaar, Jammalamadugu, Cuddapah.

(44) Ketala Rama Mohana Rao, Iron Merchant, Kolla Bazaar, Vijayanagaram, Visakhapatnam.

(45) Kolesetty Maduleti Chetty, 7/198, Suncharyulu Street, Produtur, Cuddapah.

(46) Kovur Ramaiah Chetty, 13/3 Ghandi Bazaar, Ananthapur.

(47) Korukonda Seetharamaswamy, Main Road, Kakinada, E. Godavari.

(48) Kollapara Suryasatyanarayana, Narsapur, East Godavari.

(49) Karumuri Perumallu & Sons, Bheemavaram, W. Godavari.

(50) Lakshmi Iron Stores, Main Road, Dudivada, Krishna Dt.

(51) Misrilal Motilal, Topkhana Quadeem, Opp. Osman Ganj, Hyderabad.

(52) Majestic Metal Works, Mittikasher, Begum Bazaar, Hyderabad.

(53) K. Markandeyulu, M. Kollaiah & Co., Broker Bazar, Guntur Dt.

(54) Menti Subha Rao, Main Road, Bheemavaram (W. Godavari).

(55) Marella Venkata Ramanaiah Sons, Iron Merchants, B.K.M. Street, Cuddapah.

(56) Mohd. Khasim Ali, Jammalagada, Nalgonda Dt.

(57) Mohisin Brothers, Mohsin Manzil, Harbour Road, Visakhapatnam.

(58) Neerella Bapanaiah, Post Office Road, Vinukonda, Guntur Dt.

(59) Nagavarapu Butchy Abbi Son, Main Road, Rajahmundry, East Godavari Dt.

(60) Prakash & Co., 12-1-111, Main Road, Narasaraopet, Guntur Dt.

(61) Pappu Veeranna & Sons, Dowlaishwaram, East Godavari Dt.

(62) Paluri Narayana Murthy, Iron and Steel Merchant, Railway Station Road, Anakapalli.

(63) Penugonda Kamaraju & Sons, Iron and Hardware Merchant, Tuni, East Godavari District

(64) Pullakandam Pullaiah Son Firm, Hardware Merchant, Kaman Bazaar, Khammam, Khammam Dt.

Dealers (*Concld.*)

(65) Rameshchandra Amrutlal, Shroff Bazaar Ward 13, Door No. 640, Adoni, Kurnool Dt.

(66) Raghu Cottage Industries, Main Road, Bapatla, Guntur Dt.

(67) Ramakrishna Hardware Co., Hazariwari St., Guntur Dt.

(68) C. Rama Moorthy, C/o Burmah Shell 'B', Nellore Dt.

(69) Raja Weights & Measures (Prop. Sri Venkadara Subbarayudu Setty), Jammalamdugu, Cuddapah.

(70) Revuri Satyanarayana & Sons, Rajaji Street, Kakinada, East Godavari Dt.

(71) G. Ramanaiah Nayudu, 10/32 Santhapet, Nellore.

(72) Scale Adjusting Services, Topkhana Qadeem, Osmanganj, Hyderabad.

(73) Syed Mohiuddin, Market Road, Mahaboobnagar.

(74) Syed Hussain Scale Centre, Market Road, Mahaboobnagar.

(75) Swamy Engineering Works, Swamy Alevelu Industries, Lakkavaram Post, Rozole, East Godavari Dt.

(76) M.S. Sayasaiah & Co., Main Road, Visakhapatnam.

(77) Syed Ibrahim, S/o Syed Ahmed, Kothaguda Suryapet, Nalgonda Dt.

(78) C. Suryanarayana, G.V. Satyanarayana & Co., Main Road, Vijayawada.

(79) Sadanand Engineering Works, 19/1 Azamabad, Hyderabad.

(80) Suggala Laksh Satyanarayan, Jangammnapet, Tenali, Guntur Dt.

(81) Shaik Azeez Mohiuddin, Iron Manufacturing Works, Harding Street, Ongole, Guntur Dt.

(82) Saggu Venkatanarayana Chetty & Co., Jwellers Diamond Hall, Nandyal.

(83) D. Satyanarayana Setty, General Merchant & Commission Agent, Gandhi Bazar, Ananthapur Dist.

(84) Satyanarayana Iron & Steel Works (Prop. G. Brahmaiah), Trunk Road, Kavali Nellore.

(85) Sekhar & Company, Main Road, Elore, West Godavari.

(86) Sriraja Suryanaryana, 14/11 Ghandi Bazaar, Ananthapur.

(87) N. V. Subbaiah, Mundi Merchant, Jammalamadugu, Cuddapah.

(88) Shaik Masthan & Brothers, Peer Saheb Street, Bhimavaram, West Godavari Dt.

(89) Syed Nazir Ahmed, C/o Dr. Mohd. Sultan Mohiuddin, Kandukur, Nellore Dt.

(90) Sivarama Engineering Works, K.M.S. Gupta, P. A. Chowdry & Co, P.O.B. No. 116, Sangadigunta, Guntur.

(91) Sitha Ramanjaneya Engineering Works, Dowlaishwaram, Post Office, East Godavari.

(92) Tommanna Bapanaiah & Sons, Main Road, Vijayawada, Krishna District.

(93) Tripuramalla Viswanadham, South Street, Vinukonda, Guntur Dt.

(94) Thodupnunoori Badraiah, Osmangunj, Kareemnagar.

(95) Thatha Chinnavenkata Subbaiah Sreshtty Sons, Harding Street, Ongole, Guntur.

(96) Thatha Padmanabaiah & Sons, Harding Street, Ongole, Guntur.

(97) Thoatepu Satyanarayana Murthy, Door No. 7-30-50, Main Road, Rajamundry (E. Godavari Dt.).

(98) T. L. Vishwanatthah & Bros., Post Box No. 4, Hindpur, Ananthapur.

(99) Vijay Iron Mart, Main Bazar, Adoni, Kurnool Dt.

(100) Vikkalam Pullaiah Setty, Ghandi Bazaar, Ananthapur Dt.

(101) Vijaya Weights & Measures (Prop. D.V. Ramaiah) Allagadda Post Office, Kurnool Dt.

(102) Vetcha Gangaraju Sons, 18—245, Main Road, Rajamundry, E. Godavari Dt.

(103) K. Veeraiah, Afzal Ganj, Hyderabad.

(104) Venkadari Subbarayadu Chetty & Co., 17/201, Mundi Bazaar, Cuddapah.

(105) Viruturi Gopalakrishnaiah, 14/194, Main Bazaar, Proddutur, Cuddapah Dt.

(106) Vithani Industrial Works, (Prop. K. N. Vithani) Near Railway Gate, Nizamabad.

(107) Vomina Subramanayam & Sons, 10/94, Shanthapet, Nellore.

(108) Yagnaiah & Sons, Park Road, 10/365, Vijayawada.

(109) Yella Subbarayudu, Kalvakollu Street, Amabapuram, (H.O Kothapeta) East Godavari Dt.

(110) G.S. Yoganadham, 13/111, Market Street, Chittor.

Repairers

(1) Avery Co. of India P Ltd., Post Office Road, Hyderabad.

(2) Andhra Scale Centre, 11-6-629, Nampally Road, Hyderabad.

(3) Azeez Mohiuddin, Iron and Manufacturing Works, Harding Street, Ongole.

(4) Anjanaya Weights and Measures Depot, Vinayaka Street, Tenali.

(5) ACMY Company (Prop. Mohd. Kamaruddin) B B. Bazaar, Shop No. 23-1-868, Near Mirjumla Tank, Hyderabad.

Repairers (*Contd.*)

(6) Abdul Wahab, Wahab Chowk, Tenali (Guntur).

(7) Annavarapu Rama Subba Rao, Gopala Reddy Street, Main Road, Tenali, Guntur Dt.

(8) Bharat Scale Repairing Shop, Mandi Bazaar, Warangal.

(9) Bombay Scale Adjusting Centre, (Prop. Mohd. Khaza Moinuddin) Puranihaveli, Hyderabad.

(10) Balaji Metal Works, (Prop. Padala Ramaswamy) Suryanarayanapuram, Kakinada (E. Godavari)

(11) Chitirala Venkateswarlu, 13-2-10, Main Road, Narasaraopet (Guntur).

(12) Dawood Baig, Pattabhi Market Road, Shop No. 58, Masulipatnam (Krishna Dt.).

(13) Everest & Co., Mumar Galli, Nazamabad.

(14) I.A.E.C. Burmah Shell Building, Gunfoundry, Hyderabad.

(15) Jagdamba Repairing Works, Chowk Maidan Khan, Charminar East, Hyderabad.

(16) Koduru Veeranjanaya Varaprasad Rao, Kothapet, Tenali.

(17) Misrilal Motilal, Opposite Osmanganj, Quadeem Topkhana, Hyderabad.

(18) Bombay Scale Adjusting Centre, (Prop. Mohd. Khaza Moinuddin) Puranihaveli, Hyderabad.

(19) Scale Adjusting Services, Opposite Osmanganj, Quadeem Topkhana, Hyderabad.

(20) Star Scale Services, Khasba Bazaar, Khammam.

(21) Tripuramall Viswanadham, South Street, Vinukonda, Guntur Dt.

(22) A. V. Thomas & Co. (India) Ltd., 2/21, First Line Beach, Madras-1.

(23) United Scale Centre (Prop. D. Yadgiri Raj) Sultan Shahi, House No. 22-4-416, Tajnaka, Hyderabad.

ORISSA (6)

In the March, July and November 1960 and March 1961 issues of Matric Measures lists of licensed manufacturers, dealers and repairers of weights and measures in Orissa State were published. The following is a list of manufacturers, dealers and repairers of weights and measures subsequently licensed under the Orissa Weights and Measures (Enforcement) Act, 1958.

Manufacturers

Sl. No.	Name and Address of Manufacturer	Details of Articles Manufactured
(1)	Agrawala Iron Works, Motilal Nehru Road, Agra	Cast Iron Metric Weights.
(2)	Avery Co. of India (Pvt.) Ltd., Avery House, 28/2, Waterloo Street, P.O. Box No. 377, Calcutta-1.	Weights, Measures, Weighing and Measuring instruments.
(3)	Agrawal Tin Manufacturing Company and Engineering Works, Sultanganj, Agra.	Cast Iron Metric Weights.
(4)	Associated Industrial Corporation, 81, North Vijainagar, Agra.	Brass Bullion and Brass Commercial Metric Weights and Dipping type cylindrical measures.
(5)	Bharat National Foundry, Motiakhan, New Delhi	C. I. Metric Weights.
(6)	B. C. Iron Foundry, Sultanganj, Agra	Cast Iron Metric Weights.
(7)	Bharati Scale and Engineering Company, 4/1 Haldaspara Lane, Khurut, Howrah, West Bengal.	Weighing Machines.
(8)	Balanga Iron Works, A/t P.O. Balasore	Cast Iron Metric Weights.
(9)	C. P. Foundry Works, Kampti Road, Bezon Bag, At/P.O. Nagpur.	Cast Iron Metric Weights.
(10)	Kohinoor Aluminium Products Ltd., Industrial Estate, Rourkella-4.	Dipping type cylindrical measures and pouring type cylindrical measures.
(11)	N. N. Karmarkar, S/o Wooma Charan Karmakar, 208, Harison Road, Calcutta.	Class 'C' and 'D' Beam Scales.
(12)	Krishna Iron Foundry, Freeganj, Agra	Cast Iron Metric Weights and Brass Bullion and Brass Commercial Weights
(13)	Mallemal Ramporsad, Belanganj, Agra.	Cast Iron Metric Weights.
(14)	Multan Engineering Works, 1773, Mirjumla, Lalkuan, Delhi-6	Dipping type cylindrical measures and puring type cylindrical measures and conical measures.

Manufacturers (*contd.*)

Sl. No.	Name and Address of Manufacturers	Details of Articles Manufactured
(15)	National Iron Foundry, Motilal Nehru Road, Agra ..	Cast Iron Metric Weights and Flat Cylindrical Brass Metric Weights.
(16)	National Foundry and Rolling Mills Ltd., Nayabazar, Cuttack.	Cast Iron Metric Weights.
(17)	National Industrial Cooperative Corporation Ltd., P. O. Jatni, Dist. Puri.	Cast Iron Metric Weights.
(18)	New Orissa Engineering Works, Khetrajpur District, Sambalpur.	Flat Cylindrical Brass Commercial and Brass Bullion Weights.
(19)	Oriental Metal Pressing Works (P) Ltd., P.B. No. 6556, Bombay-18 (131-Worli).	Dipping type cylindrical capacity measures and puring type cylindrical measures.
(20)	Rourkella Machine Tools, Rourkella, Industrial Area, Rourkella-4.	Cast Iron Metric Weights.
(21)	Riaz and Brothers, Sadar Bazar, New Delhi	Brass metric weights and dipping type cylindrical measure and conical measures.
(22)	Seetharam Engineering Works, P. O. Dawalisharam, Dist. East Godavari, Andhra Pradesh.	Beam Scales.
(23)	Standard Steel and Iron Foundry, Laxmi Mills Building, Jeoni Mandi, Agra.	Cast Iron Metric Weights.
(24)	Satish Chandra Das and Co., 113, Khangrapatti Street, Calcutta.	Brass Bullion and commercial metric weights and class 'B' weighing scales.
(25)	R. K. Tiwari, Proprietor, Orissa Agricultural Industries, Khetrajpur, Sambalpur.	Cast Iron Metric Weights.
(26)	Utkal Metal Industries, Khetrajpur, District Sambalpur	Flat Cylindrical Brass Weights and Flat Cylindrical Bullion Weights.
(27)	D. L. Vaid, 215-Ripon Road, Bombay-8	Brass Bullion and Brass Commercial Metric Weights.

Dealers (Licensed for Weights, Measures, Weighing & Measuring Instruments)

(1) Abba Hossion Salemohd., At/P.O. Rajgangpur.
(2) Avery Co. of India P. Ltd, Station Road, Calcutta-3.
(3) Bhuramal Rungta, P.O. Khetrajpur, District Sambalpur.
(4) Bhagwan Ram Ram Raja Ram, College Square, Cuttack-3.
(5) Baboolal Gupta, for 'Ispat Udyog', P.O. Rairangton, Dt. Mayurbhanj.
(6) Birdi Chand Rameswar, Dolmandap Sahi, Puri.
(7) Biswanath Misra, At/P.O. Nayagarh, Dt. Puri.
(8) Bhanjanagar Regional Cooperative Marketing Society, Bhanjanagar.
(9) Bijay Bhandar, Phulbani.
(10) Biharilal Omprakash, Rourkella-1.
(11) Bargarh Regional Cooperative Marketing Society, At/P.O. Bargarh, Dt. Sambalpur.
(12) Bharataram Kandu, Ranihat, Cuttack-3.
(13) Chandrakant Jayantilal, Nayasarak, Cuttack-2.
(14) Dwarka Prasad Sharma & Brothers, At/P.O. Bali Sahi, Dt. Puri.
(15) Dinanath Dubey, Khetrajpur, Sambalpur.
(16) Digambar Bhanj, Haladiagarh, Haladia, Puri.
(17) Dhanuram and Sons, College Square, Cuttack-3.
(18) Dhenkaval Regional Cooperative Marketing Society, Dhenkanal.
(19) Eppili Linga Raju, Chetrapur, Ganjam.
(20) Fakir Chowdhury, Sakhigopal.
(21) Giridharilal Kedia, Jharsuguda, Sambalpur
(22) Gopikrishna Dey, Motiganja Bazar, At/P.O. Balasore, Dt. Balasore
(23) Gaurang Charan Kar, Kendrapara.
(24) Gobind Prasad Rambilas, Main Road, Sambalpur.
(25) P. K. Gosh, Puri.
(26) Hadu Tarai Ranglal, Biramitrapur
(27) Hadu Subudhi and Lakkon Subudhi, Kharuda Street, Big Bazaar, Barhampur, Dt. Ganjam.
(28) Jeypore Regional Cooperative Marketing Society, Bhanjanagar.
(29) Jayakrishna Pattanaik, Attagarh.
(30) Khandelwal Iron and Steel Co., At/P.O. Baripada, Dt. Mayurbhanj.
(31) Khubram Asharam, Bolangir.
(32) Khalli Panda, Balugaon.
(33) Kedarnath Agarwalla, Biramitrapur, Sundergarh.

Dealers (*contd.*)

(34) Kishorelal Agarwala for "Ramanand Chandrabhan" Talcher, Dhankawal.
(35) Laxminarayan Choudhury for Orissa Scientific Co., Opp. High Court, Cuttack-2.
(36) Murlidhar Gopalkrishan (P) Ltd., Post Box No. 18, (Arad Bazar), At/P.O./Dt. Balasore.
(37) Manoharlal Agarwala for 'Suresh Stores' At/ Rajagangpur, Sundargarh.
(38) Mahadeoprasad Krishna Prasad, College Square, Cuttack-3.
(39) Mohamad Haji and Co., At/P.O. Angul, Dt. Dhenkanal.
(40) Mungelal Rameshwarlal, Kantabanji, Dt. Bolangir.
(41) Mungalal Gupta, Kesinga.
(42) Mishra and Partner, Ranihat, Cuttack.
(43) Manilal Doshi, Motiganja Bazar, Dt. Balasore.
(44) R. C. Nandi and N. K. Nandi, Purna Bazar, P.O. Bhadrak, Dt. Balasore.
(45) Narsingh Trading Co., Raigarh, Sambalpur.
(46) Nanagaram Agarwala Khetrajpur, Sambalpur.
(47) Nowrangpur Regional Cooperative Marketing Society, Nowrangpur
(48) Narayan Sahoo, Bolagarh, Puri.
(49) Nandakrishore Padhi, Paralakhemendi.
(50) Orissa Hardware Stores, Sambalpur.
(51) Puskarlal Hariprasad, At/P.O. Baripada, Dt. Mayurbhanj.
(52) S. Pal Chowdhury Buxi Bazar, Cuttack.
(53) Punjab General Stores, Bhubaneswar.
(54) T. Panchunath Patro for 'Prajanandhu Stores', Bus Stand, At/P.O. Aska, Dt. Ganjam.
(55) Raghunath Rath, Tata Street, Bijapur, P.O. Berhampur, Dt. Ganjam.
(56) Remeshwarlal Khandelwal At Motiganj Bazar, Balasore.
(57) Rasiklal & Co., Keonjhar.
(58) Ramotar Agarwalla, At/P.O. Jatni, Dt. Puri.
(59) Ramji Jagajiban, Dhenkanal.
(60) Ruliram Agarwal, Tililagarh, Bolangir.
(61) Raghunath Singh Mishra, Nayagarh, Puri.
(62) Sundergarh Regional Cooperative Marketing Society Ltd., Dt. Sundergarh.
(63) Sreeram Sitaram Rangali, Sambalpur.
(64) Sahu and K. H. Sahu, At/P.O. Talcher, Dt. Dhenkanal.
(65) State Cooperative Marketing Society, Cuttack.
(66) Satrughan Industries, Betnoli.
(67) Sabudhi Hardware Stores, Asha.
(68) Sadanand Subudhi & Partner, Main Road, Beokampur.
(69) Sitaram Dunkuram, Angul.
(70) United Supply Agency, Western Tower, House No. 14, Market Building, Bhubaneswar.
(71) Utkal Agency, Sambalpur.
(72) G Venkataraju & P. Janardhan Rao, Big Bazar, Berhampur.
(73) Utkal Traders' Union, Baripada.

Repairer

Sl. No.	Name and Address of Repairers	Details of Articles Repaired
(1)	Avery Company of India Private Ltd , Cuttack-3	Weights, Measures, Weighing and Measuring Instruments.
(2)	Orissa Agricultural Industries, Firm Road, Sambalpur ..	Weights, Measures, Weighing and Measuring Instruments.

PONDICHERRY (1)

The following is a list of Manufacturers, Dealers and Repairers licensed under the Madras Weights and Measures (Enforcement) Act, 1958, as extended to the State of Pondicherry.

Manufacturers

Sl. No.	Name and Address of Manufacturers	Details of Articles Manufactured
(1)	Rajan Engineering Enterprises, West Boulward, Pondicherry	Conical measures and length measures.
(2)	Swamy Foundry, 232, Bis, West Boulward, Pondicherry	Conical measures and length measures.

Dealers

Sl. No.	Name and Address of Dealers	Details of Articles Sold
(1)	N. A. Arumuga Mudaliar, Bharathi Street, Pondicherry	All types of weights and measures.
(2)	S. K. Annamalai Chetty, No. 94, Bharathi Street, Pondicherry	All types of weights and measures.
(3)	Ananda Emporium, Dupleix Street, Pondicherry	Weighing Instruments only.
(4)	Batchu Paparao, S/o Vincanna, Yanam	All types of weights, measures, weighing and measuring instruments.
(5)	B. K. Chappan Nair, Merchant, Mahe	All types of weights, measures, weighing and measuring instruments.
(6)	Grinde Manicka Chetty Son, 56, Dupleix Street, Pondicherry	Weighing instruments only.
(7)	Grandy Somaganapahy Rao, S/o Latchmaya, Grand Bazaar Street, Yanam.	All types of weights, measures, weighing and measuring instruments.
(8)	Honesty Society, 73-A, Mission Street, Pondicherry ..	All types of weights, measures, weighing and measuring instruments only.
(9)	R. S. Krishna Chetty & Bros., 41, Thirunallar Road, Karaikal	All types of weights, measures, weighing measuring instruments.
(10)	P. V. Muniswamy Chetty Sons, No. 92, Bharathi Street, Pondicherry.	All types of weights and measures.
(11)	Metal Ware House, 86, Dupleix Street, Pondicherry ..	All types of weights, measures and weighing instruments.
(12)	V. S. Muthuramalinga Chetty and Brothers, Market, Karaikal	All types of weights measures and weighing instruments.

Repairers

Sl. No.	Name and Address of Repairers	Details of Articles Repaired
(1)	Avery Company of India Private Limited, 16-17, Armenian Street, Madras-1.	All types of weighing instruments and weights.
(2)	T. Natesa Achari, 78, Gandhi Road, Pondicherry ..	Weighing instruments only.

PUNJAB (13)

In the July and September 1959, March, May, July, September and November 1960 and March, May, July, November 1961 and January 1962 issues of Metric Measures, lists of manufacturers, dealers and repairers of weights and measures in Punjab were published. The following is a list of manufacturers, dealers and repairers subsequently licensed under Punjab Weights and Measures (Enforcement) Act, 1958:

Manufacturer

Sl. No.	Name and Address of Manufacturer	Details of Articles Manufactured
(1)	S. K. Engineering Works, Regd., G T. Road, Batala. ..	*Cast Iron Weights* 100 g to 50 Kg. *Ordinary Brass Weights* 10g to 50g (Standard Capacities)

Dealer

Sl. No.	Name and Address of Dealer	Details of Articles Sold
(1)	Ganpat Ram Harbans Lal Kaithal	Weights, Measures, Weighing and Measuring Instruments.

Repairer

Sl. No.	Name and Address of Repairer	Details of Articles Repaired
(1)	Eleka Industries, Rainak Bazar, Jullundur City .. .	Weights, Measures, Weighing Beam-scales, Platform Machines.

New 15-Year CUMULATIVE TIME DEPOSIT Savings Scheme

With effect from 1st June, 1962, a new 15-year account with a maximum monthly deposit of Rs. 300 has been introduced. The existing limit of monthly deposits in the 10-year account has also been increased to Rs. 200 with effect from the same date.

INCOME-TAX REBATE

As in the case of life insurance premia and contributions to Provident Funds, the deposits made in the 10 and 15-year accounts will be eligible for earning a rebate on Income-Tax, subject to the overall limit of Rs. 10,000 or $\frac{1}{4}$ of income, whichever is less.

TAX-FREE INTEREST

The deposits in the 10 and 15-year accounts earn a return of 3·8 and 4·3 per cent, compound interest, free of income-tax.

Further particulars from the nearest Post Office Saving Bank.

SAVE REGULARLY WITH CUMULATIVE TIME DEPOSITS
5-YEAR/10-YEAR AND THE NEW 15-YEAR ACCOUNTS